
Text

When you want to add some basic annotations to your drawing use one of the text tools. You can create and edit text. You can use the Text menu to set the characteristics such as font, text size and case. The topics discussed in this chapter include:

- Text tools
- Text Commands

Tech Note:

This Designer Elements program does not support the importation of text documents.

Text Tools



This Designer Elements program has three tools for creating text: **Horizontal Text**, **Text Along a Curve** and **Text at an Angle**. The text tools in this Designer Elements program do not use text boxes. Simply click the cursor at the location you want the text to begin and start typing. Press ENTER (Windows) or RETURN (Macintosh) to end one text object and begin another. These text objects move independently.

Horizontal Text Tool



The Horizontal Text tool creates horizontal text at the location you specify.

Using the Horizontal Text Tool

1. Select the Horizontal Text tool from the main tool palette. The Message Line reads: *Enter location for text [Press Mouse to End]*.
2. Place the cursor at the beginning location for the text and click. The cursor becomes a text cursor.
3. Enter the desired text. If you press ENTER (Windows) or RETURN (Macintosh), you begin a new and separate line of text that is aligned left with the previous line.

The Horizontal Text tool creates separate lines.
These lines move independently.

Since this is a separate text line it can be moved independently.

The Horizontal Text tool creates separate lines.
These lines move independently.



Text Along a Curve Tool



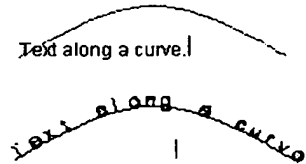
Tech Note:

This tool may not support all of your system's fonts. True Type fonts that don't form closed polygons are not supported.

The Text Along a Curve tool creates text along the curve you specify.

Using the Text Along a Curve Tool

1. Create the curve along which you want the text, placing the points in the order that you want the text placed. For a horizontal line created left to right, the text appears left to right. For a vertical line created top to bottom, the text appears top to bottom.
2. Select the Text Along a Curve tool from the main tool palette. The Message Line reads: *Select path for text [Shift=Extend]*.
3. Select the curve you just created. The cursor becomes a text cursor placed at the start point of the curve.
4. Enter the desired text. It displays horizontally.
5. Press ENTER (Windows) or RETURN (Macintosh) and the text line molds to the curve.



A parent/child relationship exists between the curve and the text. Any change that you make to the curve affects the text. Select any curve control point and drag it to a new location and the text updates.

If the curve is not long enough for the text, you can extend the curve by selecting a curve endpoint and dragging it to a new location.

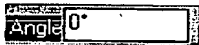
This tool only supports one line of text per curve. You cannot move the text independently of the curve. If you do not want to display the curve with the text, change the curve color to blend with your background or place the curve on the construction layer. Then you still have the ability to edit the text appearance on screen by editing the curve.

Text at an Angle Tool



The Text at an Angle tool creates text at the angle and location you specify.

1. Select the Text at an Angle tool from the main tool palette. The Message Line reads: *Enter location for text.*
2. In the Status Line, enter the angle for the text in the Angle data field. Press ENTER (Windows) or RETURN (Macintosh) to register the value.



3. Place the cursor at the beginning location for the text and click. The cursor becomes a text cursor.
4. Enter the desired text. The text displays horizontally.
5. Press ENTER (Windows) or RETURN (Macintosh) and the text angle changes.

Tip:

If you enter the angle in the Status Line after you type the text, you will have to hit ENTER (Windows) or RETURN (Macintosh) twice. The first time registers the values and the second changes the text angle to the new angle.

Text at an angle

Geometric Characteristics

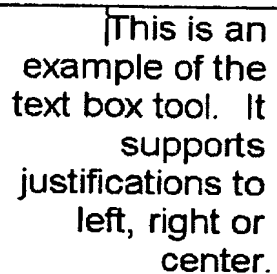
A text object is created by clicking the location of the start point of the text and typing the desired text. A text object is made up of the following characteristics according to the Edit Objects dialog box: Text and Angle. To display the dialog box, select the text and choose **Window>Edit Objects** or double-click on the text.

BoundingBox Text Tool



Bounded Box Text is defined by two diagonal points used to specify the width and height of a text box. Text is automatically wrapped to the width of the box. The text box also supports left, right and center justifications.

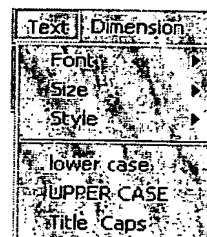
In addition, you can double click on the text to make edits directly on the screen. On screen editing supports cutting, pasting and copying into the text box. For example, you can copy of paragraph from Microsoft Word and paste it into a text box.



This is an
example of the
text box tool. It
supports
justifications to
left, right or
center.

Text Commands

All Text commands are contained in the Text menu and include commands for changing the text font, size, style and case.



This command in the Text menu changes the font for selected text or future text entries.

The screenshot shows the 'Font' menu in Adobe Photoshop 4.0. The menu is open, displaying a list of fonts. The 'Font' menu is open, showing a list of fonts including Arial Black, Arial CE, Arial CYR, Arial Greek, Arial Narrow, Arial Turk, Book Antiqua, Bookman Old Style, Century Gothic, and Comic Sans MS. The 'Font' menu is open, showing a list of fonts including Arial Black, Arial CE, Arial CYR, Arial Greek, Arial Narrow, Arial Turk, Book Antiqua, Bookman Old Style, Century Gothic, and Comic Sans MS.

Special characters and accents are available as described in Appendix B.

This command in the Text menu sets the font size for the selected text or for future text entries in the current document.

[illegible]

Specifying a Non-standard Text Size as the Default Size

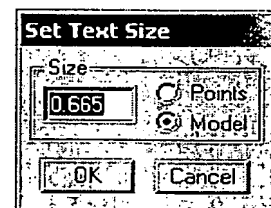
1. Choose **Text>Size>User**.

Text

2. Select the size option, either *Points* or *Units* by clicking in the appropriate radio button.
3. Enter the size you want.

If you choose *Model*, the size is measured in the current units as set in *Units* page of Preferences.

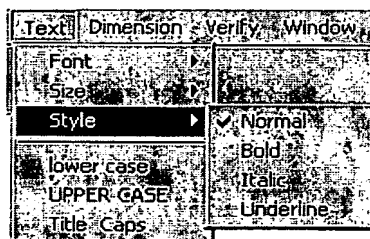
4. Click OK to accept the change and close the dialog box. Click Cancel to close the dialog box without accepting the changes.



The size you specify stays in effect until you choose another size.

Style

This command in the Text menu sets the style (such as **Bold** or Underline) for selected text or future text entries.



The style you specify stays in effect until you choose another default style. A check (✓) indicates the current style.

If you only want to change the style of one text line, select the text and choose **Text>Style** and the option you want. This does not affect the default style setting.

Case

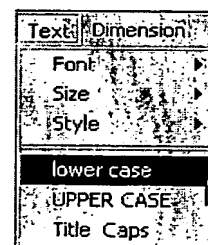
This Designer Elements program supports three text cases: lower case, UPPER CASE and Title Caps.

lower case

Displays text all in lower case letters.

UPPER CASE

Displays text in upper case letters.



Title Caps

Displays the first letter of each word in upper case and the remaining letters in lower case.

You cannot set case as a default setting like font, size and style. It simply changes the case of any selected text.

Using the Case Options

1. Select a text line.
2. Choose **Text>lower case**, **UPPER CASE** or **Title Caps**.

Your text line changes to reflect your choice.

Tip:

If you want to change from **UPPER CASE** to **Title Caps**, you must first change your text to **lower case** and then change the case to **Title Caps**.

Text Handling

You may want to perform various operations on your text like editing, moving etc.

Editing Text

To edit text you've created, select the text line and choose **Window>Edit Objects**.

In the Text entry field, make any desired changes. Click Apply to accept the changes and then Close to exit the dialog box. Click Close without hitting Apply if want to close the box without making any changes.

**Moving Text**

To move text, choose the Selection tool, select the desired text and drag the text to a new location.

Screen Horizontal Text

As seen in the picture above, the Edit Objects dialog box contains a check box for keeping text horizontal to your screen. With the box checked your text will stay horizontal to your screen when you use the Trackball to rotate your drawing. With the box unchecked your text will stay horizontal to the plane it was created on. For example, if you create text in the top view and switch to the trimetric view your text will appear as if it were lying flat.

Text

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Dimensions

This chapter explains how to use the dimension tools in this Designer Elements program. The following topics are covered:

- Dimension Menu
- Associative Dimensions
- Dimension tools
- Dimension Appearance
- Dimensions and Drawing Views

Dimension Menu

The Dimension menu contains commands for displaying the palette of dimensioning tools and for setting the format for dimensions. When you are ready to start dimensioning, choose the Dimension tool you want from the Dimension tool palette.

Like the other tool palettes, the Dimension palette is a floating tool palette. You select dimension tools in the same way you select tools from the main tool palette. The first two tools and the last tool have subpalettes which also work like the subpalettes of the main tool palette.

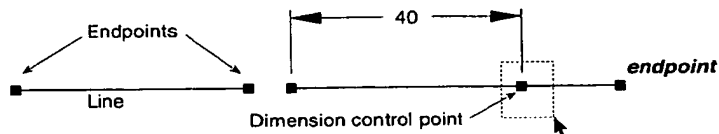


Associative Dimensions

This Designer Elements program's geometric dimensions are associative—when you make a change to the geometry, the dimension changes also. This is not true if you overwrite the # symbol in the data field or Edit Objects with a set value/text string.

This associativity is a tremendous time saver because dimensions automatically update whenever you make a change in the geometry (**Cobalt™** and **Xenon™** only). You can even change the units from English to metric (in the Units page of Preferences) and every dimension on your drawing will reflect the change.

When you extend a line by selecting the endpoint of the line and dragging it to a new position the dimension changes also because the dimension has a control point at the same position of the line's endpoint. So when you select the endpoint of the line you also select the dimension control point.



Dimensions are associative relative to the points they measure. If you change the length of a line using Edit Objects, the dimension will not update because the point was not changed. To correct the dimension, select the dimension's vertex point and drag it to the new endpoint of the line.

Dimension Tools

This Designer Elements programs dimensioning tools are on a floating palette which you can drag around the drawing area. These tools allow add basic dimensions to your drawing.

Show Palette

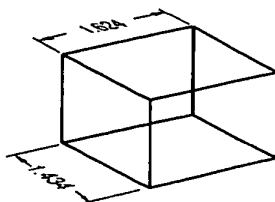
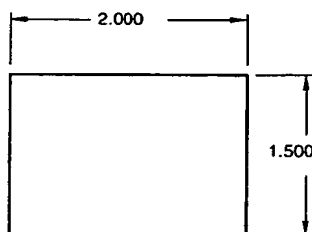
The Dimensions palette is located in the standard tools palette.

These tools can be used to measure either an object or the area between objects. Once you have dimensioned an object (or space), the dimensions update when you make changes to the geometry (**Cobalt™ and Xenon™ only**).

Some of the dimensioning tools, such as the Horizontal and Vertical tools, require that two points be selected; others, such as the Radial and Diameter, require only one. The location and the status (on/off) of the Dimension palette is automatically saved when you exit the program.

Dimensions and the Work Plane

Dimensions appear in the current work plane of the active view. (They are defined by the coordinate system of the work plane at the time they are created.) Set the work plane to correspond to the view before you begin adding text or dimensions in a view.



parallel to the work plane. If you were working in the front plane and you were using the horizontal dimension tool, the dimension would be placed parallel to the front plane.



Smart Dimension
Horizontal Dimension
Vertical Dimension
Oblique Dimension
Ordinate Dimension
Radial Arrow Out
Radial Arrow In
Diameter Arrow In
Diameter Arrow Out
Angular Dimension
Center Mark Dimension
Ballon Dimension
Length Along Curve
GDT Feature Callout

For example, if the current work plane is Top, dimensions appear parallel to the work plane regardless of the view. See the graphic here.

All point to point dimensions are also placed parallel to the work plane.

Dimension Smart Pointer

The dimension pointer is a smart pointer with a hot spot—the dot shows which side of the object to select first.



If you select as indicated by the position of the dot and cross hair, the text appears above or to the right of the leader. If you select in the opposite order, the text appears below or to the left of the leader.

Dimensioning Objects and Placement

1. Select the appropriate dimension tool.
2. Click the points you want to measure.

Dimensions automatically use the dimension pen style and current dimension text characteristics. If you want to change the dimension pen color or weight, you can do so in the Dimension menu.

3. Move the dimension to a new location if its placement is not where you want it.

Moving the Dimension

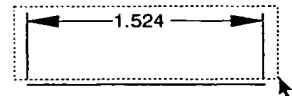
After you place a dimension, you may want to reposition it relative to your geometry. The steps differ depending on the tool. You can reposition your dimension after it has been placed with the Selection tool.

1. Choose the Selection tool.
2. Place the Selection tool over the dimension text and it becomes the Move symbol.
3. Drag the dimension to the desired location.



If you want to select more than one dimension drag a selection fence around them.

You can also reposition the text along the dimension line by dragging it along the line.



For radial and diameter dimensions, you can also reposition the dimension's control point by dragging a selection fence around the tip of the dimension line arrow.

Dimension Status Line Fields

The Horizontal, Vertical, Parallel, Angular, Center Mark and Balloon Dimension tools each have Status Line fields associated with them.

The Status Line field, similar to the one below, appears when one of these dimensioning tools is selected. Those Status Lines that differ are noted with the tools.



The # symbol in the text field indicates that the dimension is the actual value of the object's measurement. If you delete this symbol the dimension will no longer be associative (that is, it won't update if you change the geometry it measures).

You can also add text before or after the # symbol which will display with the dimension text.

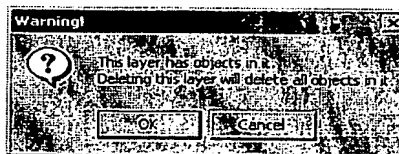
Geometric Characteristics

Dimension text is created automatically when you dimension an object and is made up of one characteristic according to Edit Objects, Text.

Automatically Placing Dimensions on a Separate Layer

This Designer Elements program automatically creates a Dimension layer. Dimensions automatically go on that layer except in the case of dimensions placed in drawing tools. These drawing view dimensions go on the Sheet View layer. See Chapter 36 for information about drawing views.

If you accidentally delete the Dimension layer, This Designer Elements program automatically recreates the layer if you close and open the file. If you try to delete the Dimension layer and there are objects on it, this Designer Elements program displays the following warning.



Dimensions and Edit Objects

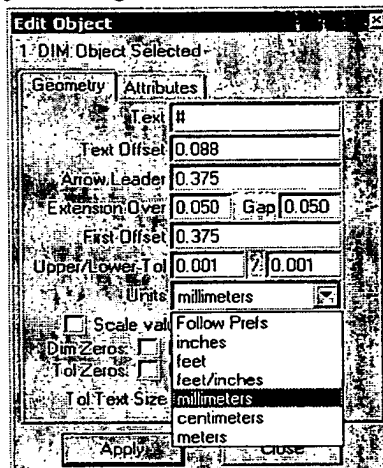
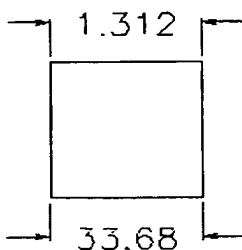
In the Edit Objects dialog box the text characteristic field includes a # symbol for all dimensions, which indicates the dimension is the actual value of the object's measurement. If you delete the # symbol and enter another value, the dimension is fixed and will not update if you change the units or the size of the geometry.

Dimensions

Some of the dimensioning tools, such as the Radial tools, add a letter in the text status box which appears in the dimension itself.

You can add text before or after the # symbol. You can enter parentheses to enclose the resulting dimension in parentheses (#), or enter # 2 Plcs to display the dimension followed by the text 2 Plcs. When you include the # symbol, this Designer Elements program uses the measurement of the geometry as well as the text you add.

Edit Objects also includes dimension characteristics including a Units data field. This field allows you to set the units for a selected dimension to those in Preferences or another settings. This allows you to dimension a part with mixed units. The graphic below shows an example of mixed units with the Edit Objects dialog box.



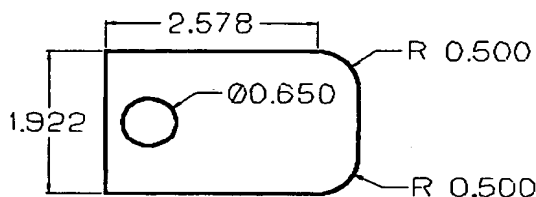
Dimension Surfaces and Solids

You can dimension surfaces and solids using the Horizontal, Vertical and Parallel dimension tools only. The Radial, Diameter and Angular Dimension tools can only be used for wireframe objects.

Smart Dimension Tool



This tool in the Dimension tool palette allows you to quickly place horizontal, vertical, radial and diameter dimensions with a single click. These dimensions are associative to the curves. As you change the curve, the dimension automatically updates (**Cobalt™** and **Xenon™** only). This tool is especially useful for drawing views.



Using the Smart Dimension Tool

1. Select the tool from the Dimension tool palette. The Message Line reads:
Smart Dimension: Pick curve to dimension.
2. Select the curve.

The dimension appears. You can drag the dimension to a new location. Dimension and extension lines automatically redraw.



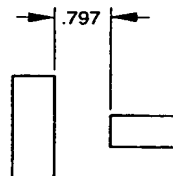
Horizontal Dimension Tools



These tools measure horizontal spaces or the distance between linear objects.



This tool dimensions objects or spaces horizontally. When you select the Horizontal Dimension tools, a subpalette appears in the Message Line containing three tools, Horizontal Dimension, Horizontal Base Line Dimension and Horizontal Chain Dimension.



Using the Horizontal Dimension Tool

1. Select the Horizontal Dimension tools. Choose the Horizontal Dimension tool from the Message Line. The Message Line reads: *Horizontal: Pick first dimension point.*



2. Click the left point of the geometry.

The Message Line now reads, *Horizontal: Pick next dimension point.*

3. Click the right point.

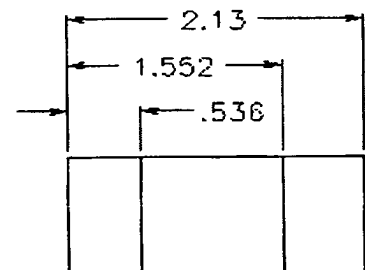
The dimension appears. You can drag it to a new location. Dimension and extension lines automatically redraw.

Click the points in the opposite order if you want the dimension to display below the objects.

Horizontal Base Line Dimension Tool



This tool dimensions objects or spaces from a base point.



Using the Horizontal Base Line Dimension Tool

1. Select the Horizontal Dimension tools. Choose the Horizontal Base Line Dimension tool. The Message Line reads: *Horizontal Base Line: Pick first dimension point.*

2. Click the base point of the geometry.

The Message Line now reads, *Horizontal Base Line: Pick next dimension point.*

3. Click the point. The dimension appears.

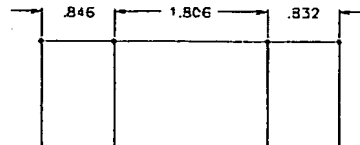
4. Click the next place for the dimension. This dimension appears above the first measured from the base point. Continue clicking the points you want dimensioned. You can drag each dimension to a new location. Dimension and extension lines automatically redraw.

Click the points in the opposite order if you want the dimension to display below the objects.

Horizontal Chain Dimension Tool



This tool dimensions objects or spaces from end to end, horizontally.



Using the Horizontal Chain Dimension Tool

1. Select the Horizontal Dimension tools. Choose the Horizontal Chain Dimension tool. The Message Line reads: *Horizontal Chain: Pick first dimension point.*
2. Click the first point on the geometry.
The Message Line now reads, *Horizontal Chain: Pick next dimension point.*
3. Click the point. The dimension appears.
4. Click the next place for the dimension. This dimension appears measured from the last point clicked. Continue clicking all the points you want dimensioned. You can drag each dimension to a new location. Dimension and extension lines automatically redraw.

Click the points in the opposite order if you want the dimension to display below the objects.

Vertical Dimension Tools



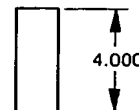
These tools measure vertical space or the distance between vertical objects. When you select the Vertical Dimension tools, a subpalette appears in the Message Line containing three tools: Vertical Dimension, Vertical Base Line Dimension and Vertical Chain Dimension.



Vertical Dimension Tool



This tool dimensions an object or space vertically.



Using the Vertical Dimension Tool

1. Select the Vertical Dimension tool. Choose the Vertical Dimension tool. The Message Line reads: *Vertical: Pick first dimension point.*

2. Click the top point of the geometry first.

The Message Line now reads, *Vertical: Pick next dimension point.*

3. Click the bottom point.

The dimension appears. You can drag it to a new location. Dimension and extension lines automatically redraw.

Click the points in the opposite order if you want the dimension to display below the objects.



Vertical Base Line Dimension Tool



This tool dimensions objects or spaces from a base point.

Using the Vertical Base Line Dimension Tool

1. Select the Vertical Dimension tools. Choose the Vertical Base Line Dimension tool. The Message Line reads: *Vertical Base Line: Pick first dimension point.*

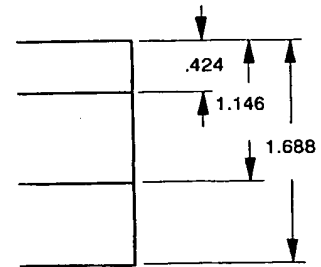
2. Click the base point of the geometry.

The Message Line now reads, *Vertical Base Line: Pick next dimension point.*

3. Click the point. The dimension appears.

4. Click the next place for the dimension. This dimension appears to the right of the first measured from the base point. Continue clicking all the points you want dimensioned. You can drag each dimension to a new location. Dimension and extension lines automatically redraw.

Click the points in the opposite order if you want the dimension to display below the objects.



Vertical Chain Dimension Tool

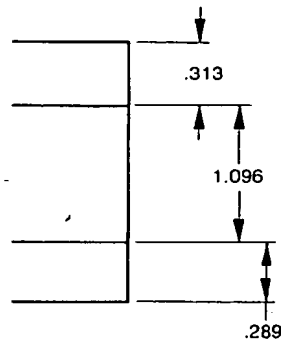


This tool dimensions objects or spaces from end to end, vertically.

Using Vertical Chain Dimension Tool

1. Select the Vertical Dimension tools. Choose the Vertical Chain Dimension tool. The Message Line reads: *Vertical Chain: Pick first dimension point.*
2. Click the first point on the geometry.
The Message Line now reads, *Vertical Chain: Pick next dimension point.*
3. Click the point. The dimension appears.
4. Click the next place for the dimension. This dimension appears measured from the last point clicked. Continue clicking all the points you want dimensioned. You can drag each dimension to a new location. Dimension and extension lines automatically redraw.

Click the points in the opposite order if you want the dimension to display below the objects.



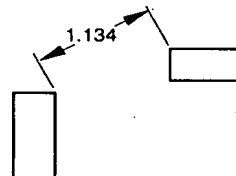
Oblique Dimension Tool



This tool measures space or objects parallel or point to point.

Using the Oblique Dimension Tool

1. Select the Oblique Dimension tool. The Message Line reads: *Oblique: Pick first dimension point.*
2. Click the left point of the geometry first.
The Message Line now reads, *Oblique: Pick next dimension point.*
3. Click the right point.
The dimension appears. You can drag it to a new location. Dimension and extension lines automatically redraw.



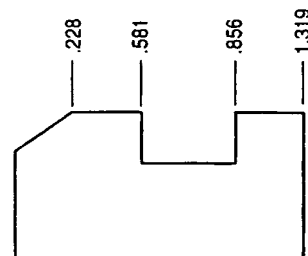
Dimensions

Click the points in the opposite order if you want the dimension to display below the objects.

Ordinate Dimension Tools



This tool dimensions objects or spaces from a base point. Use the Selection tool to move, position or create an elbow ordinate.



Using the Horizontal Ordinate Dimension Tool



1. Select the Horizontal Ordinate Dimension tool from the Message Line. The Message Line reads: *Horizontal Ordinate: Pick first dimension point.*
2. Click the base point of the geometry.
The Message Line now reads, *Horizontal Ordinate: Pick second dimension point.*
3. Click the next point. The dimension appears, measured from the base point.
4. Click the next point for the dimension. This dimension appears measured from the base point. Continue clicking all the points you want dimensioned. If you want to display a dimension at the base point, click the base point after you have dimensioned all other points.

You can drag each dimension to a new location. Dimension and extension lines automatically redraw.

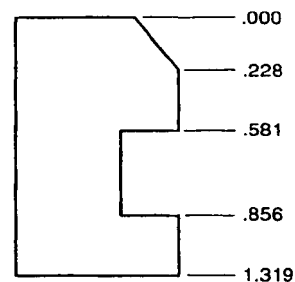


Using the Vertical Ordinate Dimension Tool

1. Select the Horizontal Ordinate Dimension tool. The Message Line reads: *Vertical Ordinate: Pick first dimension point.*



2. Click the base point of the geometry.
The Message Line now reads, *Vertical Ordinate: Pick*



second dimension point.

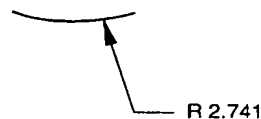
3. Click the next point. The dimension appears, measured from the base point.
4. Click the next point for the dimension. This dimension appears measured from the base point. Continue clicking all the points you want dimensioned. If you want to display a dimension at the base point, click the base point after you have dimensioned all other points.

You can drag each dimension to a new location. Dimension and extension lines automatically redraw.

Radial Arrow Out Dimension Tool



This tool measures the radius of a circle, arc, or fillet with the arrow on the side of the arc indicated when the arc is picked.



Using the Radial Arrow Out Dimension Tool



1. Select the Radial Arrow Out Dimension tool. The Message Line reads:
Radial Arrow Out: Select arc/circle.

2. Click near the circle, arc or fillet you want to dimension.

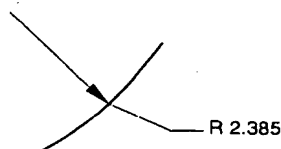
The dimension is placed on the outside of the selected object. When the dimension appears the leader line is placed at the nearest 15° increment from the location you clicked. You can move the dimension by choosing the Selection tool, selecting the dimension, placing the pointer over the end of the leader line and when the pointer becomes the Move symbol, dragging the text to a new location.

For 3D geometry, radial dimensions are created in the plane of the arc or fillet. This tool can only be used on curves, not surfaces or solids.

Radial Arrow In Dimension Tool



This tool measures the radius of a circle, arc, or fillet with the arrow inside the geometry.



Using the Radial Arrow In Dimension Tool

1. Select the Radial Arrow In Dimension tool. The Message Line reads: *Radial Arrow In: Select arc/circle.*
2. Click near the circle, arc or fillet you want to dimension.

The dimension text appears inside the object. The arrow line starts from the arc center. When the dimension appears the leader line is placed at the nearest 15° increment from the location you clicked. You can move the dimension by choosing the Selection tool, selecting the dimension, placing the pointer over the end of the leader line and when the pointer becomes the Move symbol dragging the text to a new location.

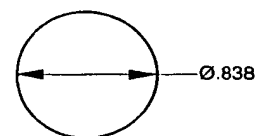


For 3D geometry, radial dimensions are created in the plane of the arc or fillet. This tool can only be used on curves, not surfaces or solids.

Diameter Arrow In Dimension Tool



This tool measures the diameter of a circle.



Using the Diameter Arrow In Dimension Tool

1. Select the Diameter Arrow In Dimension tool. The Message Line reads: *Diameter Arrow In: Select arc/circle.*
2. Click near the circle or arc you want to dimension.

The dimension appears inside the object (depending on the circle and font size). When the dimension leader line is placed at the nearest 15° increment from the location you clicked. Move the dimension by choosing the Selection tool, selecting the dimension, placing the pointer over the end of the leader line and when the pointer becomes the Move symbol, dragging the text to a new location.

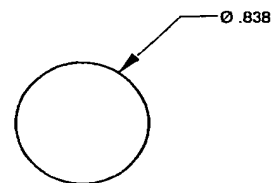


For 3D geometry, diametric dimensions are created in the plane of the circle. This tool can only be used on curves, not surfaces or solids.

Diameter Arrow Out Dimension Tool



This tool measures the diameter of a circle.



Using the Diameter Arrow Out Dimension Tool

1. Select the Diameter Arrow Out Dimension tool. The Message Line reads: *Diameter Arrow Out: Select arc/circle.*
2. Click near the circle or arc you want to dimension.

The dimension appears outside the object. When the dimension appears the leader line is placed at the nearest 15° increment from the location you clicked. You can move the dimension by choosing the Selection tool, selecting the dimension, placing the pointer over the end of the leader line and when the pointer becomes the Move symbol dragging the text to a new location.

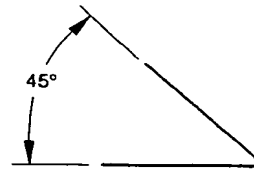


For 3D geometry, diametric dimensions are created in the plane of the circle. This tool can only be used on curves, not surfaces or solids.

Angular Dimension Tool



This tool measures the angle between two lines.



Using the Angular Dimension Tool

1. Select the Angular Dimension tool. The Message Line reads: *Angular: Pick first line.*
2. Click on the first line near the endpoint from which you want the angle measured.



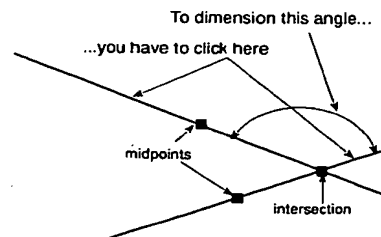
The Message Line now reads, *Angular: Pick second line.*

3. Click on the second line.

The inside angle is measured between the lines. This Designer Elements program always measures the smaller angle between the selected lines.

If you dimension intersecting lines don't confuse the intersection with the midpoint of the lines.

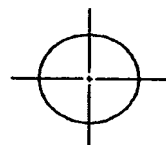
The Angular Dimension tool will not dimension angles over 180°. For 3D geometry, Angular dimensions are created in the plane of the two lines. This tool can only be used on curves not surfaces or solids.



Center Mark Dimension Tool



This tool creates a center line mark for circles and arcs. The center mark overlap can be defined in the Status Line or the Edit Objects dialog box. The overlap units are based on those in the Units page of Preferences.



Using the Center Mark Dimension Tool

1. Select the Center Mark Dimension tool. The Message Line reads: *Center Mark: Select circle for center mark [Shift = Extend]*.
2. Select the circle or arc you want to dimension. Hold down the SHIFT key if you want to dimension more than one object at the same time.

You can change the Axis overlap value in the Status Line. Type the value and press ENTER (Windows) or RETURN (Macintosh) and the overlap updates.

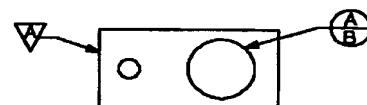
The Status Line contains the Axis overlap data field.



Balloon Dimension Tools



These tools dimension objects with a callout balloons. You have nine balloon tools available in the Message Line: Circle, Rectangle, Triangle, Inverted Triangle, Octagon, Ob-round, Split Circle, Split Rectangle and Callout.



Use the Status Line or the Edit Objects dialog box to change the text or width of the balloon dimension. The width units are based on those set in the Units page of Preferences.

Using a Balloon Dimension Tool

1. Select the Balloon Dimension tool. The Message Line reads: *Balloon: Enter 2 points for balloon dimension.*



2. Click the point on the geometry for the dimension arrow.
3. Click the second point to specify the location of the symbol.
The balloon symbol appears.
4. Enter the text and frame width in the Status Line data fields. Press ENTER (Windows) or RETURN (Macintosh) to update the dimension.
You can move the dimension by choosing the Selection tool, selecting the dimension, placing the pointer over the end of the leader line and when the pointer becomes the Move symbol, dragging the text to a new location.

Balloon dimension text does not increment as you place additional balloons. If you want specific text in the balloon dimension, you must enter it yourself.

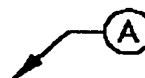
The Status Line contains Text and Width data fields.



Geometric Characteristics

According to the Edit Objects dialog box a balloon dimension includes the following characteristics: Frame, Width, Text 1, Text 2 (when a split balloon is used) and Extension. The Frame pull-down menu lists all available balloon symbols. Width defines the symbol width. Text 1 sets the upper text in a split balloon. Text 2 sets the lower text in a split balloon.

The extension is the line distance from the symbol to the leader line. In the graphic here the horizontal line is the extension.



Length Along Curve Dimension Tool



This tool dimensions curved objects such as splines.

Using the Length Along Curve Dimension Tool

1. Select the Length Along Curve Dimension tool. The Message Line reads: *Length Dimension: Specify two points along curve.*
2. Click the first point along the curve.
3. Click the second point along the curve.

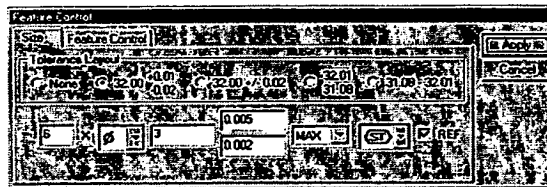
GDT Feature Control Tool



Selecting this icon from the dimensioning tool palette activates the new GD&T tool. The prompt message requests the input of 2 leader points. The first point defines the arrow location. The second point defines the shoulder location. After the leader points have been specified, the Feature Control dialog box is displayed. This dialog box contains the Size and Feature Control tab pages.

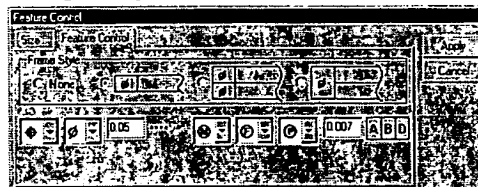
Size Tab Page

The Size tab page is used to define the basic dimension and tolerance values along with other optional modifiers. This size specification is also known as the Limits of Size. Selecting one of the five Tolerance Layout radio buttons controls the tolerance style. The dialog controls are re-positioned to match the current Tolerance Layout selection.



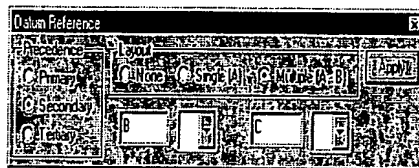
Feature Control Page

The Feature Control tab page is used to define the geometric relationships for the dimensioned feature. Selecting one of the four Frame Style radio buttons controls the layout for the feature control frames. The supported frame styles are: None, Single, Dual, and Composite. The dialog controls are re-positioned to match the current Tolerance Layout selection. The Feature Control tab also uses 2 additional support dialogs; Unit Basis and Datum Reference. The Unit Basis dialog is displayed by clicking on the region of the dialog box. The Datum Reference dialog is displayed by clicking on the region of the dialog box.



Unit Basis Dialog

When appropriate for a feature, the Unit Basis Dialog defines the unit basis interval (sub-region) over which the tolerance value is applied. The unit basis interval can be one of "None", "Linear", and "Area". A "None" interval (the default) applies the allowed tolerance over the entire feature. A "Linear" interval applies the allowed tolerance per any linear sub-length along the feature. An "Area" interval applies the allowed tolerance per any rectangular sub-area of the feature. If a linear interval is defined, the Feature Control tab page will display a /L indicator. If an area interval is defined, the Feature Control tab page will display a /LxW indicator.



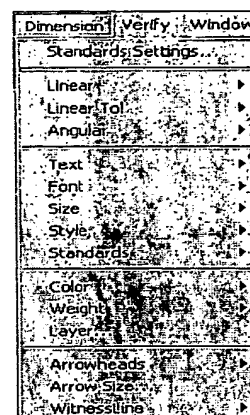
Datum Reference Dialog

When appropriate for a feature, the Datum Reference Dialog associates existing datum planes (local coordinate origin) with the dimension. A maximum of 3 datums (Primary, Secondary, Tertiary) can be associated with a feature control frame. A datum must be fully defined in order to add another datum reference. A datum consists of a datum letter (any combination of the letters A-H, J-N, P, R-Z. I, O, and Q are not allowed) and an optional modifier symbol. For a multiple datum, a second datum letter and optional modifier symbol follow a dash.

Dimension Appearance

This Designer Elements program automatically creates dimensions according to ANSI Y14.5, DIN, ISO or JIS standards. However, many companies and individuals have developed their own standards. The commands in the Dimension menu allow you to control virtually every aspect of the dimension appearance without having to construct dimensions manually and while retaining the associativity of Vellum's smart dimensions.

Settings made in the Dimension menu affect the currently selected dimension and all future dimensions.

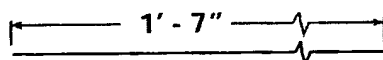


Linear

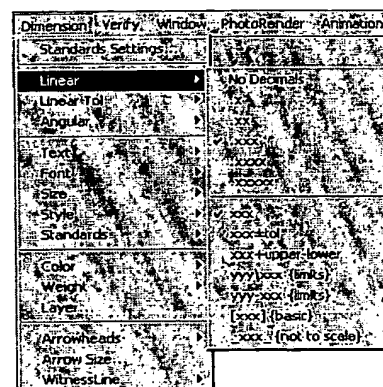
This command in the Dimension menu allows you to set the decimal precision.

All dimensions in this Designer Elements program are displayed in decimals regardless of the units set in Preferences.

If Feet/inches units is set in Preferences, objects over one foot in length will display both feet and inches.



This Designer Elements program does not support dimensioning in fractions. The default is three decimal places.



Tech Note:

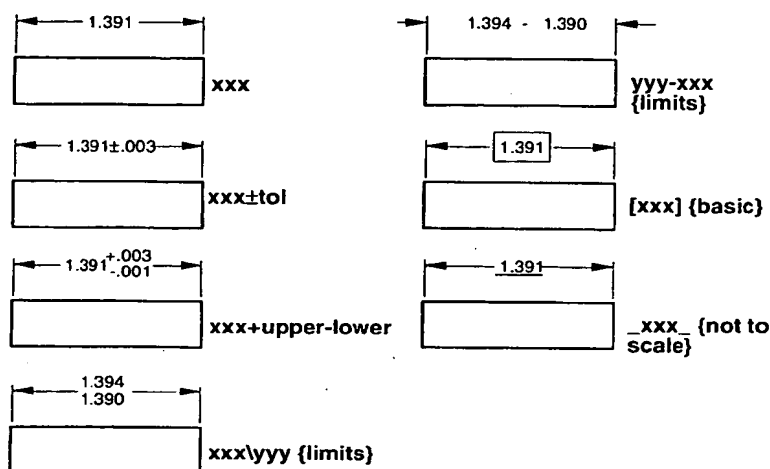
The number of decimals displayed with your dimensions is not affected by the number of decimals specified for units in Preferences.

Linear Tolerance

The **Linear** command in the **Dimension** menu allows you to set the tolerance for the following Linear Dimension tools: Horizontal Dimension tool, Vertical Dimension tool, Oblique Dimension tool, Angular Dimension tool and Smart Dimension tool. Choose ***Dimension>Linear*** to select one of the seven tolerance options.

Dimension Appearance

The following graphic shows the appearance of each tolerance option if you entered the limits shown in the Status Line.



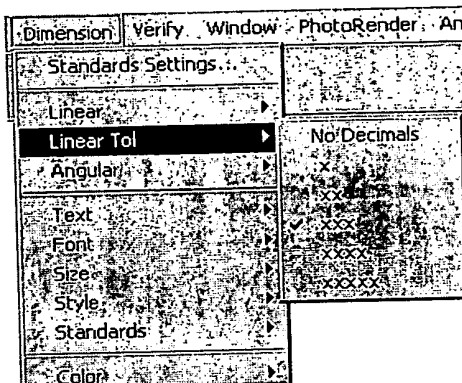
Upper Lower

When you select a Dimension tool, such as the Horizontal Dimension tool, the Status Line includes data fields for the upper and lower tolerances, as shown here.

Text #	Upper	Lower
	0.001	0.001

Dimensions

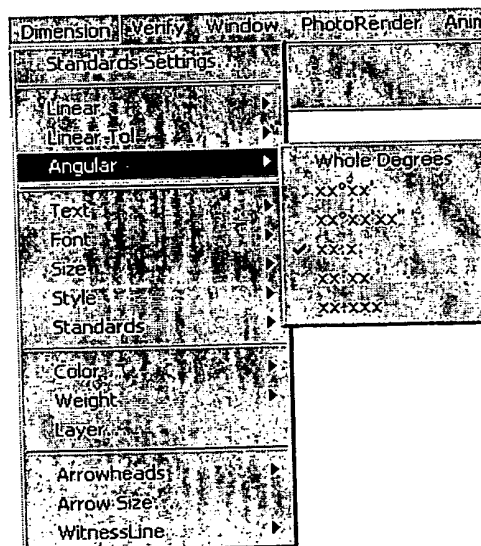
To set the number of decimal places for the linear tolerance, choose **Dimension>Linear Tol**.



Angular

This command in the Dimension menu allows you to set the format of Angular dimensions.

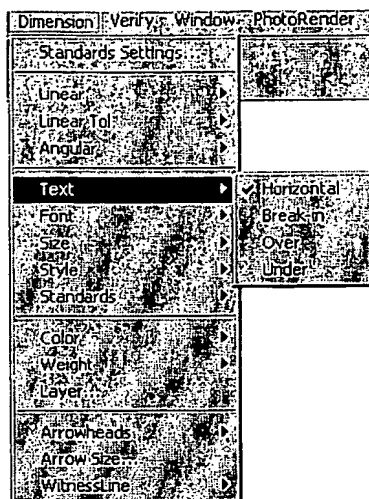
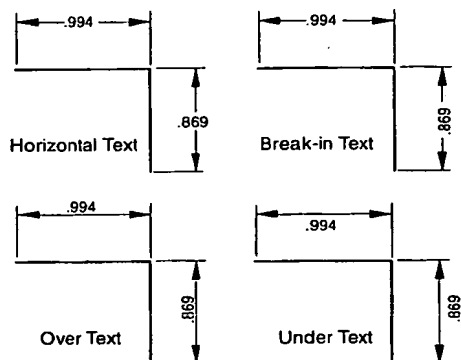
You can set degrees, minutes and seconds for angular dimensions. The default format is degrees and minutes.



Text

This command in the Dimension menu allows you to specify the position and orientation of dimension text.

The default is Horizontal text. The Break-in, Over and Under options produce text that is aligned with dimension leader lines. Over and Under display text above or below leader lines while Break-in places the text between leader lines.



Dimensions

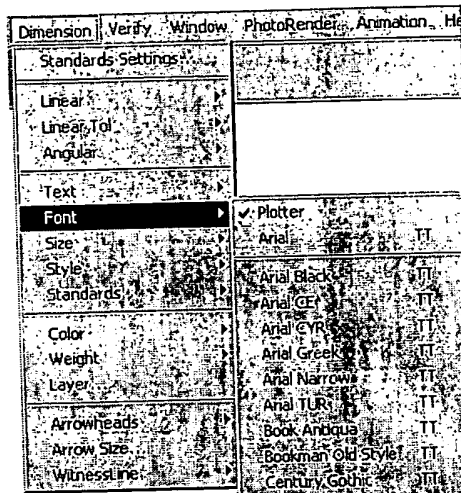
Tip:

This command only affects dimensions. To change the font of other text objects, choose **Text>Font**.

The Font submenu in the Text menu has no effect on dimensions.

Font

This command in the Dimension menu lets you pick the font for dimension text. The fonts in this list are the same as those available in the Font submenu from the Text menu.



Tip:

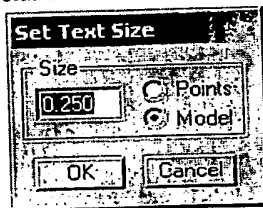
This command only affects dimensions. To change the size of other text objects, use Edit Objects or the Size submenu from the Text menu.

The Size submenu from the Text menu has no effect on dimensions.

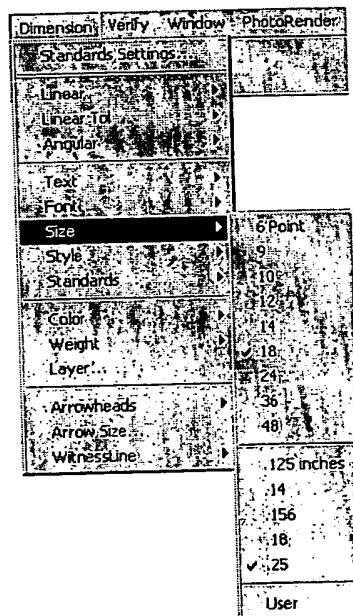
Size

This command in the Dimension menu lets you pick the size of dimension text only. The sizes in this list are the same as those available in the Size submenu from the Text menu.

Selecting the User option allows you to specify a non-standard font size for dimension text.



Selecting the Model option displays the text size in the Units you specified in Preferences. Selecting the Points option, displays the point size of the text. Select the desired radio button, enter a value in the data field and click OK.



Style

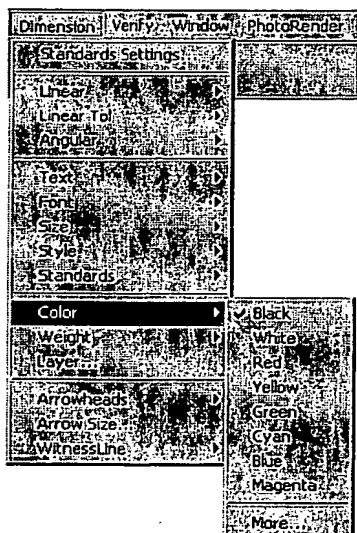
This command in the Dimension menu lets you pick the style of dimension text, Normal, Bold, Italic and Underline. The styles in this list are the same as those available in the Style submenu from the Text menu. However, these settings do not affect those in the Text menu.



Tip:

This command only affects dimensions. To change the style of other text objects, use the Style submenu from the Text menu.

The Style submenu from the Text menu has no effect on dimensions.



Color

This command in the Dimension menu allows you to specify the color of the dimension. The default color is blue.

Tip:

This command only affects dimensions. To change the color of other objects, use Edit Objects or the Color submenu from the Pen menu.

The Color submenu from the Pen menu has no effect on dimensions.

Dimensions

Tip:

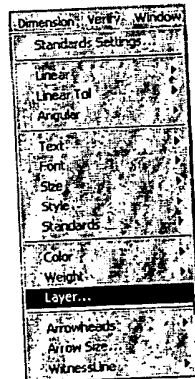
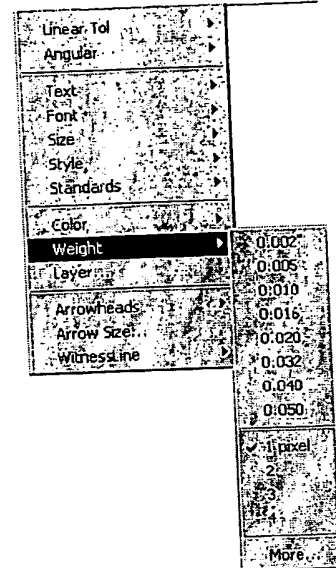
This command only affects dimensions. To change the weight of other objects, use Edit Objects or the Weight submenu from the Pen menu.

The Weight submenu from the Pen menu has no effect on dimensions.

Weight

This command in the Dimension menu allows you to specify the weight of dimension lines.

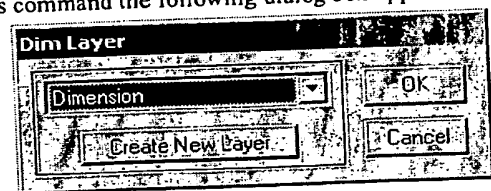
Dimension lines are typically drawn in the thinnest weight available. For this Designer Elements program, that is 0.002" or 0.05mm. The default weight is 0.002" or 0.05mm.



Layer

This command in the Dimension menu allows you to specify the layer on which dimensions are placed. This command does not apply to dimensions placed within drawing views. These are automatically placed on the Sheet View layer. See Chapter 36 for information on drawing views.

When you select this command the following dialog box appears:



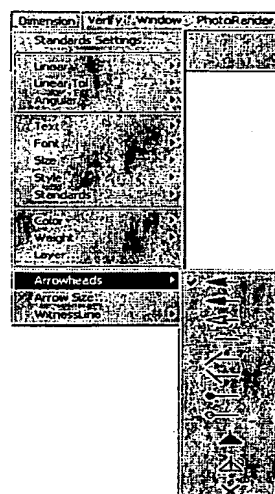
Dimensions can be placed on any visible layer. In the pull-down menu you can select a layer for your dimensions. The default layer is the Dimension layer.

You can place the dimensions on a new layer not yet created by clicking the Create New Layer button. The data field displays the new layer name. Give the layer a new name if desired. Click OK to save the change.

If the layer on which dimensions are to be placed is hidden or deleted, future dimensions will be placed on the current work layer.

Arrowheads

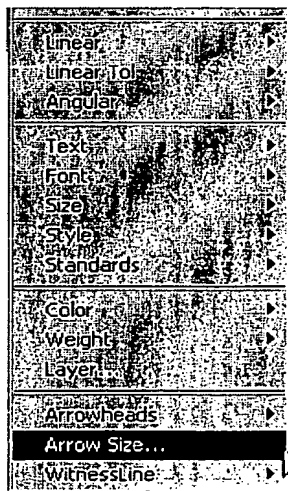
This command in the Dimension menu allows you to specify the type of arrowhead used for dimensions.



Tip:

This command only affects dimensions. To select the arrowhead type for lines or arcs, use the Arrowheads submenu from the Pen menu.

The Arrowheads submenu from the Pen menu has no effect on dimensions.



Arrow Size Command

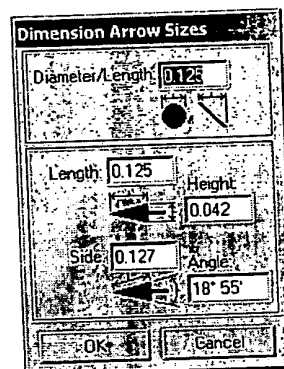
This command in the Dimension menu lets you specify the size of the arrowhead that you have selected.

Dimensions

When you select this command the following dialog box appears: This dialog box includes:

Diameter/Length

This value is the diameter or length of dots, slash and standard arrow styles. The value here affects all Length, Side and Angle fields. The value displayed is in the current units specified in the Units page of the Preferences dialog box.



Length

This value is the length of the arrowhead as the horizontal distance from its tip to the furthest extension of its base.

Height

This value is the height of the arrowhead as the vertical distance of its base.

Side

This value is the edge length of the arrowhead.

Angle

This value is the angle of the tip of the arrowhead.

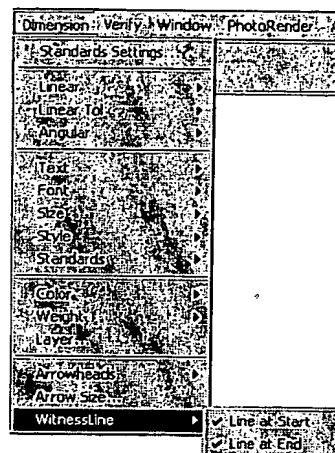
If you change any value in the Length, Height, Side, or Angle entry fields, this Designer Elements program will change the values in the other entry fields accordingly.

Witness Lines

This command in the Dimension menu lets you specify which sides of the linear dimension should have witness lines.

A check mark indicates that a witness line will be placed at the specified location. This option is useful to plot a drawing that contains baseline or chain dimensions. By turning off one or more of the overlapping witness lines, you can prevent the plotter from drawing multiple witness lines when only one is needed.

The Start of a dimension is the first point clicked. The End of a dimension is the last point clicked. The default settings have witness lines at both the start and end of a dimension.



This command affects only linear dimensions. Radial and diametric dimensions are not affected by the settings made in the Witness Lines command.

Dimension Standards

The dimension standards feature has been modified to allow you to manage and define your own standards and specify which standard is used from the Standards submenu in the Dimension menu.

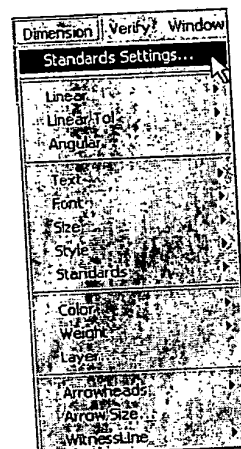
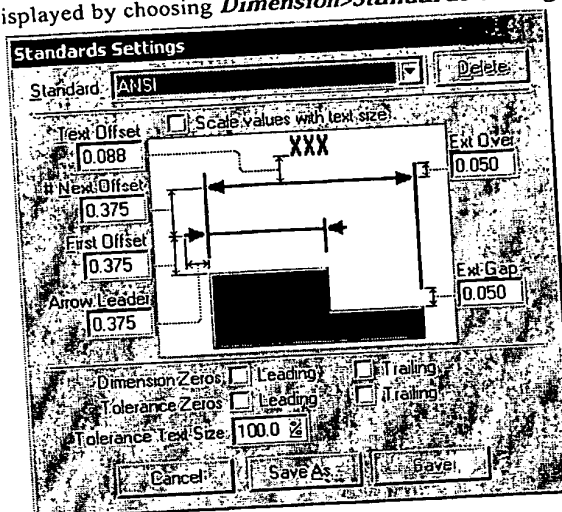
A user-defined standard contains all the current Dimension menu settings at the time the Standard Settings dialog box appears. This includes dimension text font, style and size. It does not include the Witness Line setting.

Tech Note:

The default dimension standard is ANSI. The actual setting does not save with files.

Standards Settings Manager

Dimension standards are set through the Standards Settings dialog box displayed by choosing **Dimension>Standards Settings**.



Standard

This pull-down lets you set the dimension standard. This Designer Elements program contains settings for ANSI, DIN, ISO, JIS and the new Architecture, Dual Side, Dual Stacked and Stacked Fraction default standards. These default standards cannot be altered. However you can create user-defined standards and save them under their own name. Examples of each default standard follow this section.

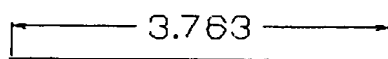
Text Offset

This entry field controls the distance from the base of the dimension text to the leader lines. A positive entry places the text above the leader lines, and a negative value places it below the leader lines. A zero value places the text on the leader lines.

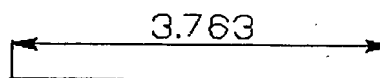
Next Offset

This entry field controls the perpendicular distance between subsequent leader lines.

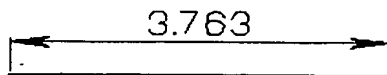
First Offset	This entry field controls the perpendicular distance between the object being dimensioned and the leader line and dimension text. Changes to this value only affect new dimensions.
Arrow Leader	This entry field controls the distance the leader lines extend beyond the witness lines when the arrows appear outside of the witness lines.
Ext Over	This entry field controls the distance the witness lines extend beyond the leader lines.
Ext Gap	This entry field controls the distance between the dimension point and the witness lines.
Delete	Click this button to delete a user-defined standard. (This button is unavailable for the ANSI, DIN, ISO, JIS, Architecture, Dual Side, Dual Stacked and Stacked Fraction default standards.)
Cancel	Click this button to close the dialog box without accepting any changes.
Save As	Click this button to save the settings for a user-defined standard under a new name.
Save	Click this button to save changes to a user-defined standard. (This button is unavailable for the ANSI, DIN, ISO, JIS, Architecture, Dual Side, Dual Stacked and Stacked Fraction default standards.)



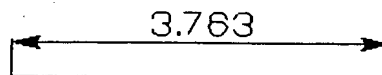
ANSI Standard



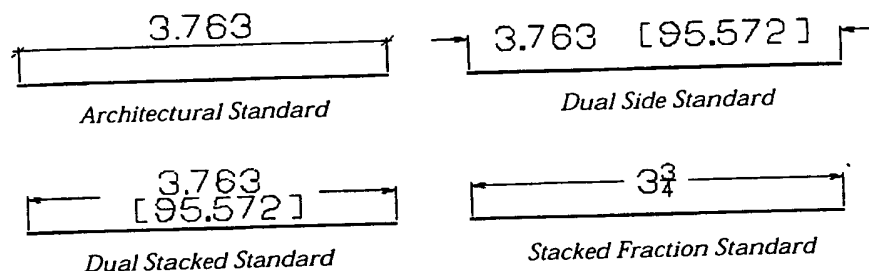
DIN Standard



ISO Standard



JIS Standard



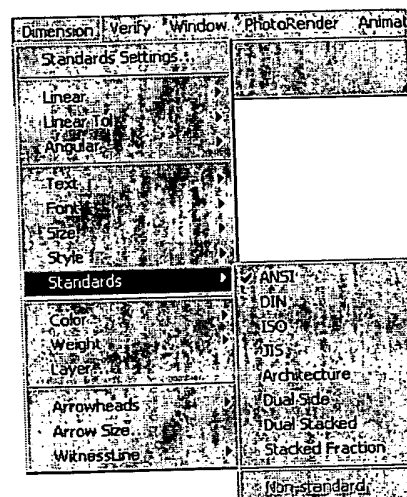
Setting the Standard

A Standards menu allows you to set the standard as the default or change the standard for a selected dimension. If you have created user-defined standards, they are also listed in the Standards menu.

Choosing a Standard

You can choose one of the predefined standards or a user-defined standard. Changing the standard will also change the Dimension menu settings. If no dimension is selected, you are setting the default standard. If one or more dimensions are selected, you are only changing the standard for the selected dimensions.

1. Choose **Dimension>Standards**.
2. In the Standards submenu, choose one of the listed standards.
3. Click OK to accept the standard as the default and close the dialog box.



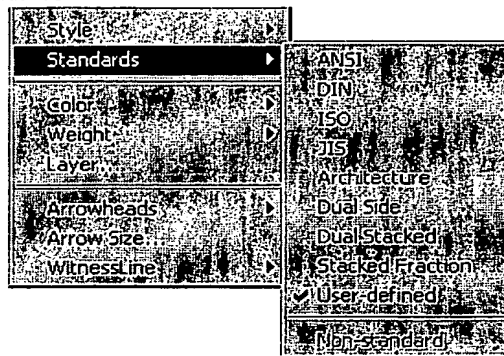
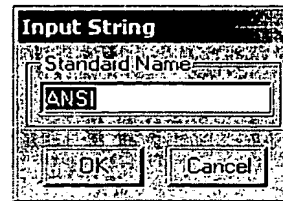
Creating a User-defined Standard

1. Choose **Dimension>Standards Settings**.
2. Enter values in the desired fields.
3. Click Save As.

An Input String dialog box appears with a Standard Name data field.

4. Enter a new name in the data field.
5. Click OK to close the dialog box and save the new standard.

You can later delete this user-defined standard through the Standards Settings dialog box. This standard also adds to the Standards menu.



Dimensions and Drawing Views

If dimensions in the drawing view go outside the bounds of the view so that you can't see them, choose the Frame to Extent command in the Drawing View menu. You can also drag the view edge manually to completely display the dimension. See Chapter 36 for information on drawing views.

Dimensions created in drawing views are placed on the Sheet View layer rather than the Dimension layer. This allows you to turn off all other layers including the Dimension layer when printing the sheet. This is helpful when you have dimensioned the original geometry and do not wish to print those dimensions.

Dimensions

27-34

Fill and Crosshatching

This Designer Elements program provides you with the ability to apply fill to smart polygons and to apply crosshatching to your geometry. This is especially useful for setting certain objects apart visually.

This chapter covers the following topics:

- Fill Pattern and Fill Color
- Crosshatching

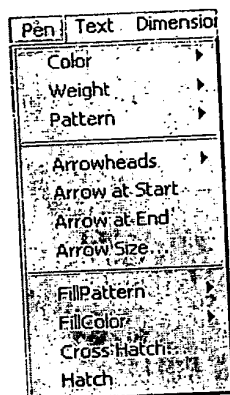
Fill Pattern and Fill Color

This Designer Elements program provides Fill Patterns and Fill Color for *Smart Polygons* created with the Polygon tools: Rectangle, Inscribed Polygon, Circumscribed Polygon, Arbitrary Polygon and Polygon from Curves. These patterns and colors enable you to highlight the polygons or separate overlapping polygons visually in your drawing. After creating the polygon, you place a fill pattern and fill color in the polygon. If you make changes to the polygon the pattern and color automatically update.

Tech Note:

Fill Pattern and Fill Color are not the same as Crosshatching or Solid Fills. Fill Pattern and Fill Color are predefined bitmaps and cannot be edited.

Fill and Crosshatching



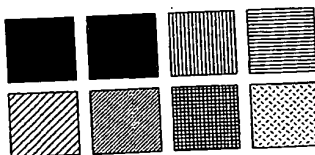
In the Pen menu you will find the two fill commands—*Fill Pattern* and *Fill Color*.

These commands work with each other. Using the *Fill Pattern* command, choose the pattern for your polygon. Using the *Fill Color* command, choose the pattern color.

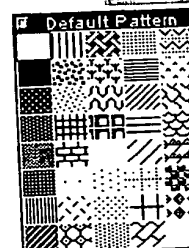
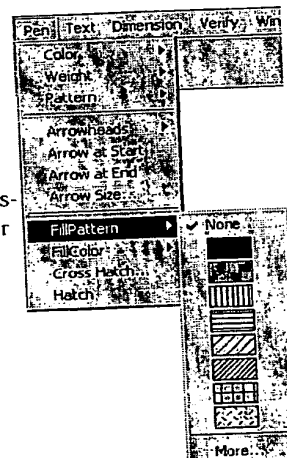
Fill Pattern

A wide variety fill patterns are available. Patterns appear parallel to the work plane and only in the view in which they were added. In other words, patterns are drawn correctly when viewed along the z-axis of the work plane.

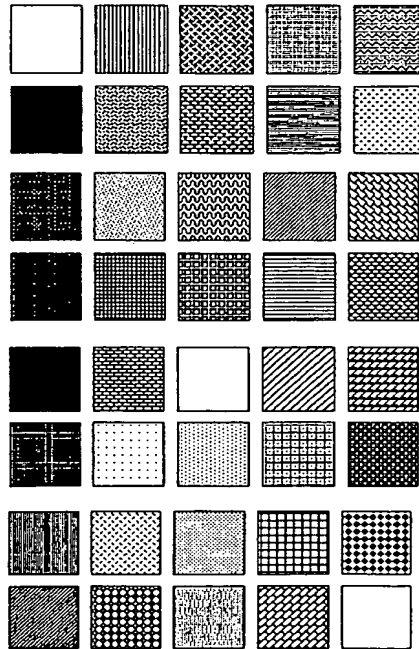
When you select the *Fill Pattern* command a submenu displays. You have the option to choose None (for no fill) or one of eight patterns (including solid fill) as shown here.



If you select **Pen>Fill Pattern>More**, the Patterns option box appears providing you more patterns.



The patterns are enlarged below for clarity.



You cannot edit these patterns. They are predefined bitmaps. The default pattern is None.

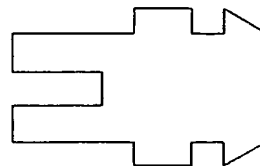
Choosing a Fill Pattern

1. Choose the Selection tool.
2. Select the polygon that you want to display with a fill pattern. Hold down the SHIFT key to select more than one polygon.

One example is displayed here.

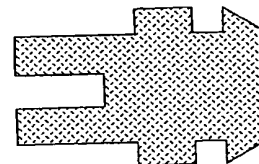
3. Choose **Pen>Fill Pattern** and one of the fill patterns.

(If you choose a fill pattern from the Patterns option



Fill and Crosshatching

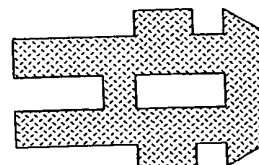
box, a selection box will appear around the pattern.)
The polygon is filled with the selected pattern.



Fill Patterns and Holes

This Designer Elements program does not support the placement of "holes" in polygons. However, you can place a polygon within another polygon and choose a solid white fill to give the illusion of a hole.

Using the example above you would get the following result.

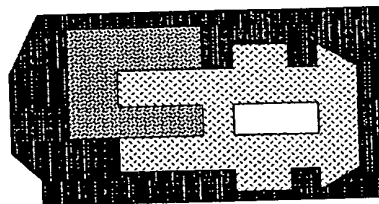


Overlapping Objects and Patterns

Since you can have multiple objects with multiple patterns displayed in your drawing, there may be times when some overlapping occurs.

You can specify the order of the overlapping in two ways:

- Select the objects with the Selection tool in the reverse order that they are displayed on the screen
- Adjust the placement of the objects using the *Arrange* command in the Layout menu (see Chapter 24 for more information on using this command).



You can use the *Group* command in the Layout menu to keep the patterned objects in the specified order.

Changing the Existing Pattern of a Polygon

1. Select the existing polygon with the Selection tool.

2. In the Pen menu, choose a new pattern from the Fill Pattern submenu.
The fill pattern changes as you specified.

Removing the Fill Pattern

1. Select the existing polygon with the Selection tool.
2. In the Pen menu, choose None from the Fill Pattern submenu.
The fill pattern is removed.

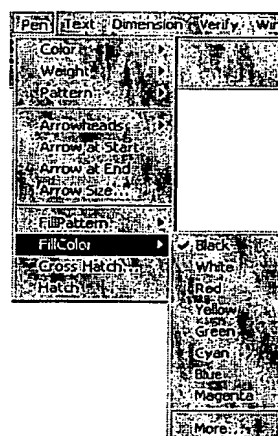
You can also double-click the object to display the Edit Objects dialog box and change the Fill characteristic from Yes to No.

Fill Color

This command in the Pen menu works only with the *Fill Pattern* command.

The submenu displays the same colors available for creating geometry (see Chapter 5, "Pen Settings").

You can choose a specific color for all fill patterns. The default color is black.



Choosing a Fill Color

1. Choose the Selection tool.
2. Select the polygon you want to fill.
Hold down the SHIFT key to select more than one polygon.
3. Select the fill color. The color displays.
4. Choose **Pen>Fill Color** and select the desired color.
The new fill pattern color is displayed in your polygon.

You cannot choose a fill color for a polygon that does not contain a pattern.

Changing the Color of an Existing Fill

1. Select the existing polygon by clicking it with the Selection tool.
2. In the Pen menu, choose a new color from the Fill Color submenu.
The fill pattern color changes as you specified.

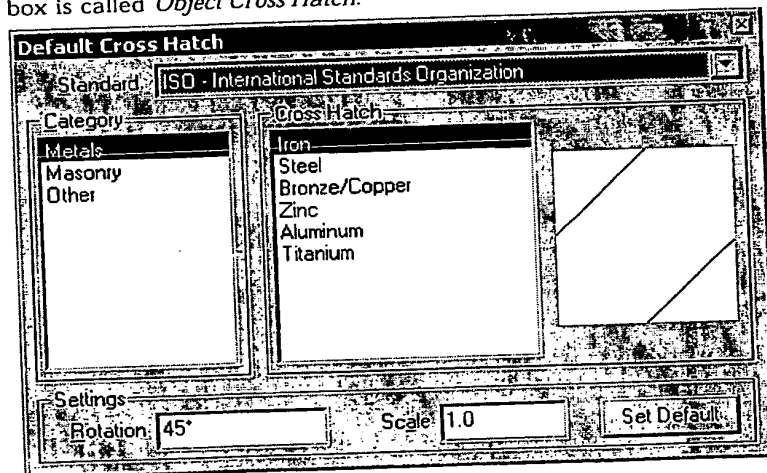
Crosshatching

This Designer Elements program can crosshatch any enclosed area in your drawing and then automatically update the crosshatching when you change the geometry. You can select a closed area containing a hole or cutout and this Designer Elements program accurately excludes the cutout area from the crosshatching. Crosshatching can also be applied to section cuts made through your geometry when using the drawing composition tools.

The Pen menu contains two crosshatching commands: *Cross Hatch* and *Hatch*. Use these to apply crosshatch patterns to your geometry.

Cross Hatch Patterns

You have a wide variety of crosshatch patterns available to you in both ISO and DIN styles. Choosing **Pen>Cross Hatch** brings up a dialog box. If no objects are selected the dialog box is called, *Default Cross Hatch*. If objects are selected, the dialog box is called *Object Cross Hatch*.



The dialog box contains the following options:

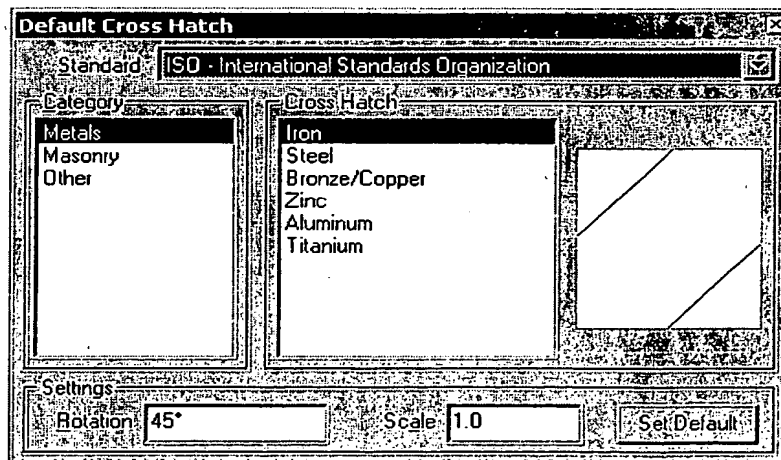
Standard

This option sets the crosshatching standard. Select either the ISO (International Standards Organization) standard or the DIN (German Standards Institute) standard from the pull-down menu.

Category	This section lists the hatch categories available for the selected standard.
Cross Hatch	This section lists the crosshatch patterns available for the selected category.
Pattern Window	This window, to the right of the Cross Hatch list, displays the selected crosshatch pattern.
Rotation	(Settings) This field sets the rotation angle of the crosshatch pattern.
Scale	(Settings) This field sets the scale of the crosshatch pattern.
Set Default	(Default Cross Hatch dialog box) Click this button to set the default crosshatch pattern for your drawing.
Apply	(Object Cross Hatch dialog box) Click this button to apply the crosshatch pattern to the selected object.

ISO Patterns

If you choose the ISO standard the ISO categories and crosshatch patterns display in the dialog box.



Fill and Crosshatching

The categories for the ISO standard are:

Metals

The patterns in this category include: Iron, Steel, Bronze/Copper, Zinc, Aluminum and Titanium.

Masonry

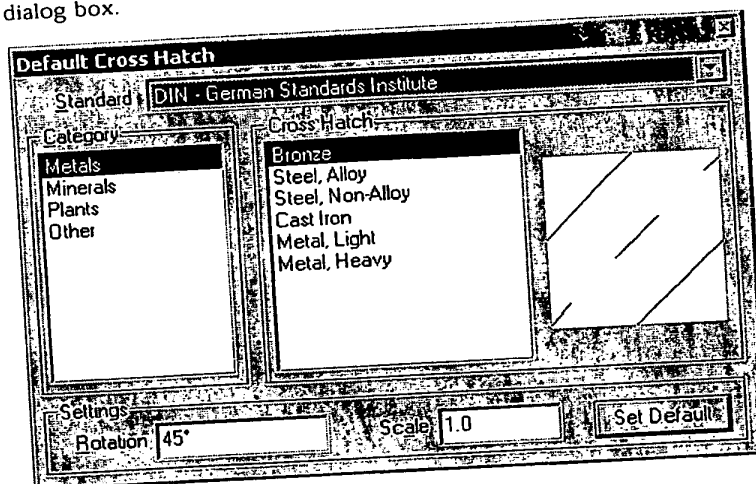
The patterns in this category include: Brick and Concrete.

Other

The patterns in this category include: Rubber, Electric, Marble/Glass, Thread, Grass, Earth, Fabric, Insulation and Mud.

DIN Patterns

If you choose the DIN standard the DIN categories and crosshatch patterns display in the dialog box.



The categories for the DIN standard are:

Metals

The patterns in this category include: Bronze, Steel (Alloy), Steel (Non-Alloy), Cast Iron, Metal (Light) and Metal (Heavy).

Minerals

The patterns in this category include: Rock, Sand, Clay, Peat/Humus Soil, Coal, Salt and Sandstone.

Plants

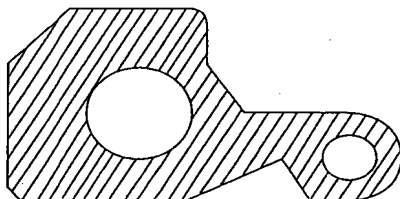
The patterns in this category include: Wood (Horizontal Grain), Wood (Vertical Grain), Wood (Materials), Wood (Cut) and Tar.

Other

The patterns in this category include: Masonry (Brick Work), Masonry (Increased Strength), Masonry (Light Brick), Masonry (Pumice) Plaster Plate, Plaster (Mortar I), Plaster (Mortar II), Concrete (Reinforced), Concrete (Non-reinforced), Concrete (Pumice) and Concrete (Waterproof).

Crosshatch Command

This command in the Pen menu enables you to apply crosshatching to your geometry.

**Setting the Default Hatch Patterns**

When no objects are selected, you can set the default crosshatch pattern for the current session of this Designer Elements program.

1. Choose **Pen>Cross Hatch**. The Default Cross Hatch dialog box appears.
2. Choose the crosshatch standard from the pull-down menu.
3. Choose the category and the crosshatch pattern. The pattern appears in the pattern window.
4. Specify a rotation angle and scale.
5. Click Set Default. The default crosshatch pattern is set.
6. Click the Close button (Windows) or the Close box (Macintosh) to close the dialog box.

If you choose the *Hatch* command in the Pen menu this default pattern is applied to your selected geometry.

Applying a Crosshatch Pattern for an Object

If one or more objects are selected, you can choose a specific crosshatching for them without changing the default.

1. Select the object you want to crosshatch.
2. If you want to apply the default crosshatch, choose **Pen>Hatch** and the object is crosshatched.
If you want to apply a different crosshatch, choose **Pen>Cross Hatch**. The Object Cross Hatch dialog box appears.
3. Choose the crosshatch standard from the pull-down menu.
4. Choose the category and the crosshatch pattern. The pattern appears in the pattern window.
5. Specify a rotation angle and scale.
6. Click Apply. The pattern is applied to the selected object.
7. Click the Close button (Windows) or the Close box (Macintosh) to close the dialog box.

Geometric Characteristics

According to the Geometry page of the Edit Objects dialog box, crosshatching has the following characteristics: Rotation and Scale. You can change the values and click ENTER (Windows) or RETURN (Macintosh) to alter the hatching.

Hatch Command

This command in the Pen menu crosshatches the selected objects using the default crosshatch pattern.

1. Select the object you want to crosshatch.
2. Choose **Pen>Hatch**.
The selected object crosshatches with the default pattern.

Editing Hatching

You can edit a crosshatch pattern for a selected object by changing the pattern, rotation or scale.

To change the hatch pattern select the hatching within the object and choose **Pen>Cross Hatch**. Change the hatching and click Apply.

To change the hatch pattern rotation angle and scale you can do so in the Object Cross Hatch dialog box or in the Edit Objects dialog box.

Crosshatching and Section Cuts

Crosshatching is especially valuable for sections cuts created using the drawing composition tools.

When hatching is placed in a section cut the default hatch pattern is used. Like any other crosshatch pattern, you can change the pattern, rotation and scale. You can also choose different hatch patterns for objects cut in the same section. See Chapter 36, "Drawing Composition," for information on sections and the drawing composition tools.

Fill and Crosshatching

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Symbols

In this Designer Elements program, symbols are used to define 2D or 3D shapes that frequently occur throughout a drawing. They can be wireframe, surface or solid objects. When used properly, symbols and instances dramatically speed the design and drafting process while reducing your file size.

An instance is a copy of the original or master geometry. It is created when you place a symbol in your drawing or modify that symbol by moving, rotating or scaling it.

A symbol consists of a master symbol composed of geometry (text and dimensions are not supported) which is instanced into a drawing by clicking the placement location. Once a symbol is placed you can use the **Transformation** tools to move, rotate, scale or mirror it.

Symbols are created and organized through the Symbol Manager. Once the symbols are created use the **Symbol** tools to place them into your drawing.

The following topics are covered in this chapter:

- Symbol Palette
- Symbol Manager
- Creating Symbols
- Symbol Tools
- Symbol Example
- Transforming Symbols

Symbols

- Editing Symbols
- Symbols and Rendering
- Symbols and Files

Symbol Palette



The symbol tools are contained in the Symbol tool palette. To display the palette choose **Window>Symbols**.

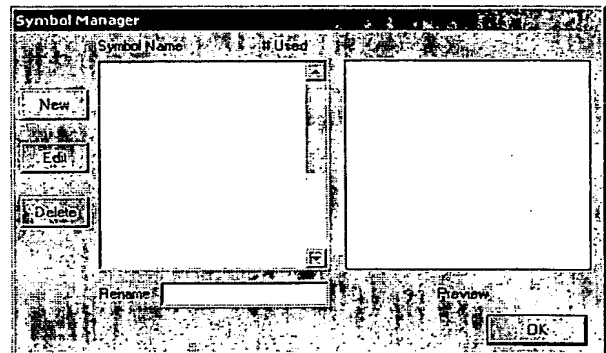
The default status of the Symbol palette is closed and the default location is below the main tool palette. Like the other palettes, you can save the status and location of the palette anywhere in your drawing area.

There are two tools for placing symbols into your drawing. **Symbol 1 Point** and **Symbol 2 Point**. Before you are able to use these tools, you must create the symbol through the Symbol Manager. Once you create your symbol, use one of these tools to place it into your drawing.

Symbol Manager

Use the Symbol Manager to create and organize symbols in your drawing file. To display the Symbol Manager select one of the symbol tools and press the CTRL key (Windows) or the OPTION key (Macintosh).

The Symbol Manager contains the following elements:




Symbol Name

This list displays the names of all master symbols contained in the file whether or not they are instantiated into the drawing.

Used

Lists the number of times a master symbol is instantiated into your drawing.

Preview	Displays a 2D preview of the selected symbol in window.
Rename	<p>Allows you to rename any of the symbols in your drawing. When you initially create a symbol this Designer Elements program automatically provides a name.</p> <p>To change the symbol name, select the symbol name from the list and enter a new name in the <i>Rename</i> data field. The name updates as you type.</p>
New	Opens the Edit Symbol drawing screen for creating a new symbol.
Edit	Opens the Edit Symbol drawing screen to edit a selected symbol in the <i>Symbol Name</i> list.
Delete	<p>Deletes the selected symbol and all instances (copies) of the symbol in your drawing.</p> <p>If you have instances of the symbol in your drawing when you click this button, the following dialog box appears.</p>  <p>Click Yes to delete the symbol and all instances or No to close the box and return to the Symbol Manager.</p>

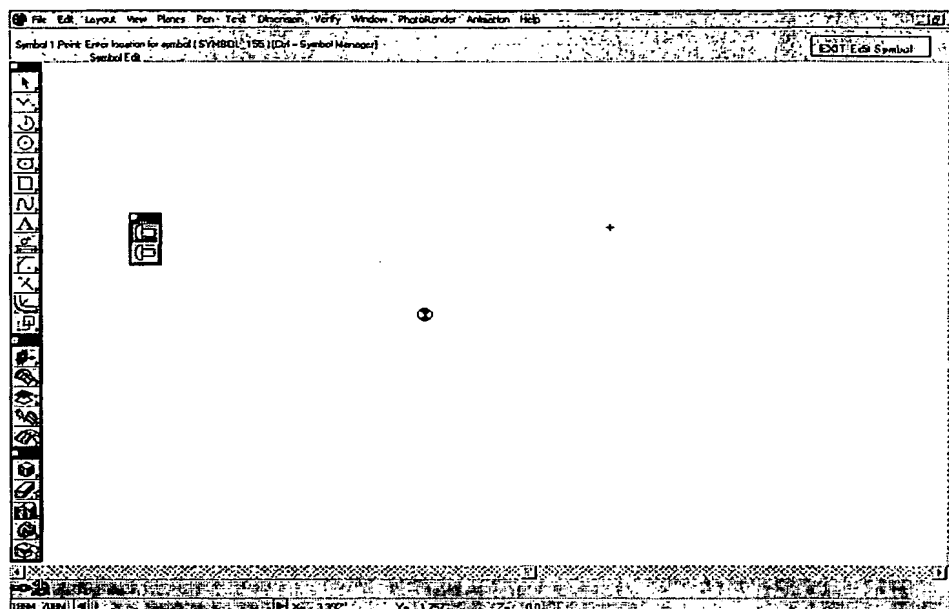
Creating Symbols

Creating symbols is identical to creating any geometry in this Designer Elements program. Symbols cannot contain text or dimensions. When you create a symbol, you are creating a master. You place copies or instances of this symbol into your drawing using one of the symbol tools.

1. Select a symbol tool.
2. Press CTRL (Windows) or OPTION (Macintosh) to display the Symbol Manager.

Symbols

3. Click the New button. The Symbol Edit screen displays.



The screen is almost identical to the standard drawing area except for the EXIT Edit Symbol button and the Symbol Edit name in the Work Layer Indicator.

EXIT Edit Symbol

Click this button in the upper right corner of the drawing area when you finish creating your symbol geometry to return to the drawing area.

Symbol Edit

This name in the Work Layer Indicator indicates you are in the Symbol Edit screen. This layer is not accessible in the Layer Manager.



The Axis is located at the origin for a master symbol. The origin is represented by this marker.

4. Create your symbol geometry.
Use all of the tools and commands of this Designer Elements program.
5. When you complete your symbol geometry, click the EXIT Edit Symbol button to return to the standard drawing area.

Follow these steps to create more symbols for your file.

Like all other geometry, symbols are saved with your file. They do not become a part of a library for use with other files.

This Designer Elements program does not support text or dimensions with symbols.

Symbol Tools

This Designer Elements program include two symbol tools for instancing symbols into your drawing, Symbol 1 Point and Symbol 2 Points.

Symbol 1 Point Tool



The Symbol 1 Point tool places a copy of the selected symbol at the location you specify. The symbol x-axis is aligned with the x-axis of the work plane.

Using the Symbol 1 Point Tool

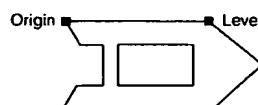
1. Select the Symbol 1 Point tool. The Message Line reads: *Symbol 1 Point: Enter location for symbol [Ctrl (Windows) or Option (Macintosh) = Symbol Manager].*
2. Press the CTRL key (Windows) or OPTION key (Macintosh) to display the Symbol Manager.
3. Select the symbol you want to place in your drawing.
4. Click OK to close the Symbol Manager dialog box.
The Message Line displays the name of the selected symbol.
5. Click in the drawing area to set the symbol's origin (as defined by the master).
The symbol is placed in your drawing. You can place as many instances of the symbol as you desire.



Symbol 2 Points Tool



The Symbol 2 Points tool places a copy of the selected symbol at the origin and lever point you specify. The



Symbols

lever point defines a rotation for the inserted angle and represents the top right corner of the symbol. See the graphic here.

Using the Symbol 2 Points Tool

1. Select the Symbol 2 Points tool. The Message Line reads: *Symbol 2 Points: Enter symbol origin and lever point [Ctrl (Windows) or Option (Macintosh) = Symbol Manager].*



2. Press the CTRL key (Windows) or OPTION key (Macintosh) to display the Symbol Manager.

3. Select the symbol you want to place in your drawing.

4. Click OK to close the Symbol Manager dialog box.

The Message Line displays the name of the selected symbol.

5. Click the location for the symbol origin. The location is the symbol origin defined by the master symbol.

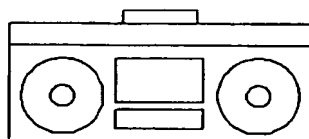
6. Click the lever point. The symbol is placed in your drawing.

You can place as many copies of the symbol in your drawing as you desire.

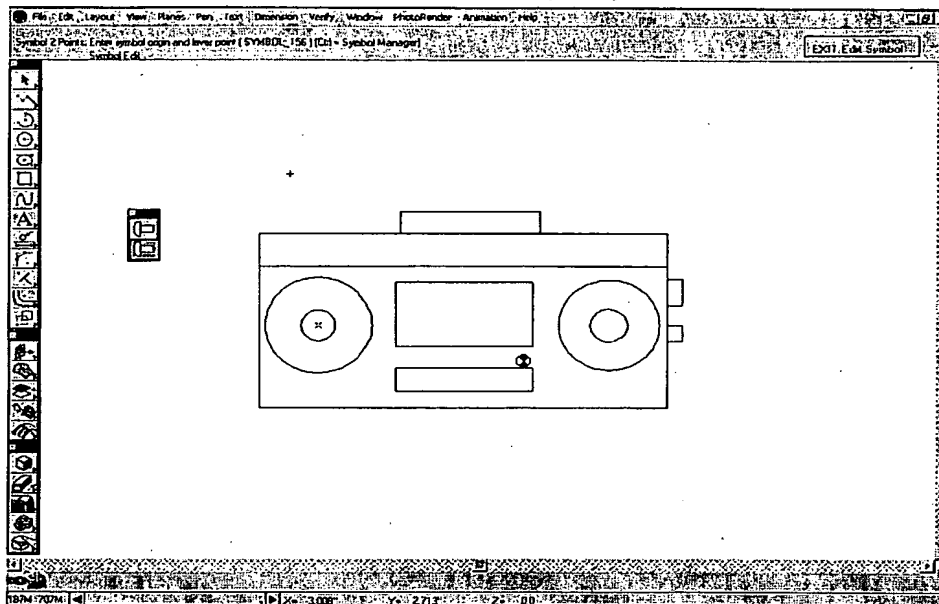
Symbol Example

Try this simple example of creating and placing a symbol.

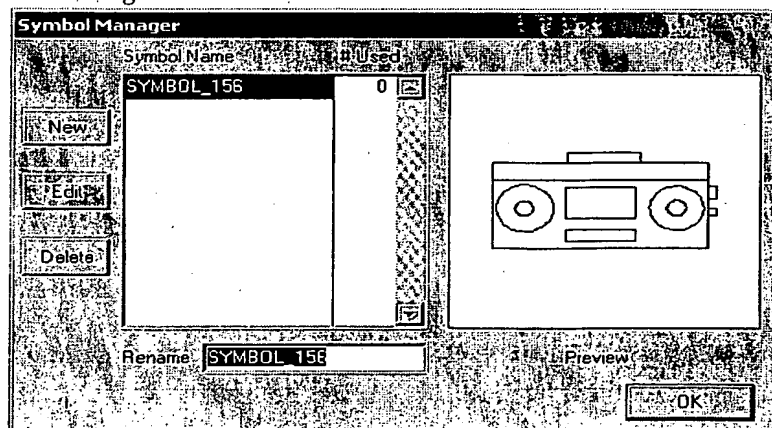
1. Open a new file.
2. Choose **Window>Symbols** to display the Symbol tools palette, if it is not already displayed.
3. Select the Symbol 2 Points tool.
4. Press the CTRL key (Windows) or the OPTION key (Macintosh) to display the Symbol Manager.
5. Click on the New button. The Symbol Edit screen appears.
6. Create an object similar to the graphic here.



7. Once you've completed your symbol, select the Symbol 2 Point tool and then click the EXIT Edit Symbol button in the upper right corner.



8. Press the CTRL key (Windows) or the OPTION key (Macintosh) to display the Symbol Manager.



Symbols

Your symbol geometry is displayed in the *Preview* window with a default name in the *Symbol Name* list.

9. In the *Rename* field, already highlighted, type *BoomBox*. As you type, the name is replaced in the *Symbol Name* list.
10. Click OK to accept the name and close the Symbol Manager.

The Message Line now includes the name, *BoomBox*. (If it does not click the Symbol 2 Points tool again.)

Symbol 2 Points: Enter symbol origin and lever point (SYMBOL -156) [Ctrl = Symbol Manager]

11. In your drawing click to place the origin point.
12. Move the cursor to the right horizontally using the Drafting Assistant and click to place the lever point.

The *BoomBox* symbol is placed in your drawing. If you had clicked a level point at a 45° angle, the BoomBox Symbol would have been placed at that angle.

13. Press the CTRL key (Windows) or the OPTION key (Macintosh) to display the Symbol Manager. The # *Used* field shows that the symbols was instanced once in your drawing.

Using the **Transformation** tools you can now perform numerous operations on the symbol.

Transforming a Symbol

Once you place a symbol you can use the **Transformation** tools to do some manipulation. You can move, rotate, scale or mirror the symbols. Follow the steps for using these tools in Chapter 25, "Transforming Geometry."

You can also move a symbol with the arrow keys and the **Selection** tool. Select a symbol by dragging a selection fence around it.

Editing a Symbol

Symbols cannot be edited in your drawing area, only in the Symbol Edit screen.

1. Select a symbol tool.
2. Press the CTRL key (Windows) or OPTION key (Macintosh) to display the Symbol Manager.

3. Select the symbol you want to edit.

4. Click on the Edit button.

The Symbol Edit screen displays.

5. Make your changes.

6. Click the EXIT Edit Symbol button.

All symbol instances of the edited master symbol are updated.

Symbols and Rendering

This Designer Elements program does not support the rendering of symbols. If you want a symbol to render you must open the symbol through the Symbol Manager, copy the symbol and paste it into your drawing. Then the object, which is no longer a symbol, can be rendered.

Symbols and Files

Sometimes you may have symbols you want to use in more than one file or that were created elsewhere.

Using Symbols in Other Files

Symbols are file specific Symbols created in one file are not automatically available as a symbol for other files. However, if open the file in the Symbol Manager, you can copy and paste the geometry into a new Symbol Edit screen in another file. This way you won't have to recreate the geometry.

This Designer Elements program does not support Symbol libraries.

Importing

You can import drawing files into this Designer Elements program and then place that geometry within the Symbol Edit screen by copying and pasting. You can make additions to the symbol in the Symbol Edit screen.

This Designer Elements program does not automatically support importing symbols from Vellum 3D. Geometry from a symbol file can be imported into this Designer Elements program copied and then pasted into the Symbol Edit screen as mentioned above.

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Viewing Geometry

In this Designer Elements program you create your geometry in one model space and view it from many different angles and view scales as needed. A view describes the orientation of your eye position and direction toward your geometry. You can use a number of tools and commands to help you to view your geometry. The following topics are covered:

- Zooming
- Panning
- View Displays
- View Rotation
- View Commands
- Views and Planes
- Views and Zoom Scale

Zooming

This Designer Elements program gives you several ways to change the magnification of your drawing by zooming in and out using commands, zoom tools, and strokes.

Zoom Commands

Zoom In, *Zoom Out*, *Zoom All*, *Zoom Previous*, *Zoom Window*, *Zoom Home* and *Zoom Ratio* from the View menu change the view magnification of your geometry depending upon your selection and input. If you want to zoom a particular area, use the *Stroke* feature or the *Zoom* tool, described later in this chapter.

Zoom All - CTRL+F (Windows); z +(Macintosh)

This command in the View menu zooms in or out to make all objects on your drawing fill the screen, regardless of the size of the objects.

Zoom In - CTRL+] (Windows); z +] (Macintosh)

This command in the View menu zooms in to the screen center by a factor of two.

Zoom Out - CTRL+[(Windows); z +[(Macintosh)

This command in the View menu zooms out from the screen center by a factor of two.

Zoom Previous

This command in the View menu zooms to the previous magnification.

Zoom Window - ALT+4 (Windows); z +4 (Macintosh)

This command in the View menu allows you to drag a selection fence around the desired view window (from the upper left to the lower right).

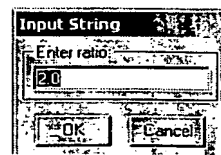
Zoom Home - ALT+6 (Windows); z +6 (Macintosh)

This command in the View menu adjusts the view scale so that the origin of the drawing (0, 0, 0) is centered on the screen.

Zoom Ratio Command

This command in the View menu displays an Input String dialog box.

Enter a ratio in the data field. A value of .5 zooms out by a factor of two. A value of 2 zooms in by a factor of two. Click OK to close the dialog box and save the value. Your drawing scales to the value.



Zoom Tools



The Zoom tools are located in the View tool palette.

Using the Magnifying Glass Tool

With the Zoom tools you drag a selection fence around an area on the screen, so only that area is displayed.

1. Select the Zoom tool from the tool palette.
2. Drag a box around the area on the screen you want to magnify or reduce.
3. Release the mouse button. The content of the dragged box is displayed.

Zoom Tool



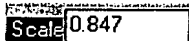
This tool zooms in by the specified factor. The default factor is two. You can also specify a zoom scale (1 = full scale) in the Scale field of the Status Line. Zooming causes a visual rather than a physical change.

1. Choose the Zoom In tool. The Message Line reads: *Zoom In: Pick area to enlarge [Ctrl (Windows) or Option (Macintosh) = Zoom Out].*

If you want a specified zoom scale, enter the value in the Scale data field.

2. Click in the drawing area; that position is displayed in the center of the screen and the drawing is enlarged by a factor of two. You can also drag a selection fence around an area, so only that area is displayed.

The Status Line contains the Scale data field.



Pressing the CTRL (Windows) or the OPTION (Macintosh) key while using this tool causes it to change to the Zoom Out tool.

Using the Dynamic Pan Tool



This tool is located in the View tool palette at the bottom of the main tool palette.

Tip:

Using the CTRL (Windows) or the OPTION (Macintosh) key, you can toggle between the **Zoom In** and **Zoom Out** tool.

Viewing Geometry

1. Select the Dynamic Pan tool. The Message Line reads: *Dynamic Pan: Drag mouse to translate view.*



The pointer becomes a hand icon.



2. Place your pointer over the section of the screen you want to move and drag. When you release the mouse, the view has been repositioned. Notice that the scroll bars have adjusted accordingly.

Dynamic Zoom Tool



This tool zooms in or out by the amount specified by your stroke in the drawing area.

1. Choose the Dynamic Zoom tool. The Message Line reads: *Dynamic Zoom: Drag mouse to zoom view. Move right zooms out.*



2. Move the cursor to the drawing area. The cursor becomes the dynamic zoom icon.



3. Drag the mouse to the right to zoom out or to the left to zoom in. The view scale changes according to your stroke.

Stroke Zoom

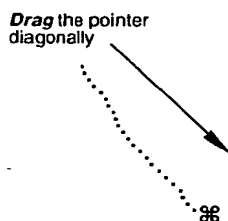
You can use stroke commands to zoom—magnify or reduce your drawing. Stroke commands are useful because they don't require you to get out of the tool you're using in order to zoom. Hold down the SHIFT+CTRL keys (Windows) or the z key (Macintosh) and drag diagonally across the screen as described below. The pointer takes on the z shape when you hold down the SHIFT+CTRL (Windows) or the z key (Macintosh) keys.

This Designer Elements program remembers up to eight zoom strokes, enabling you to return to previous zoom magnifications.

Tech Note:

Windows users: The Stroke Zoom function is not accessible for tools that already use the SHIFT and CTRL keys. This note is repeated in the chapters containing the tools to which this applies.

Using Stroke Zoom



Drag Diagonally

Upper left to lower right

Lower right to upper left

Upper right to lower left

Lower left to upper right

Result

Zoom-in enlargement: centered over the stroked area.

Zoom Previous: Reverses *Zoom In* stroke to the previous magnification.

Zoom-out reduction: the current screen reduces to the size of the area defined by the stroke.

Zoom Previous: Reverses *Zoom Out* stroke to previous magnification.

Note: For *Zoom In* and *Zoom Out*, the size and location of the stroke rectangle is important for determining the result of the *Zoom* operation. For *Zoom Previous*, the size and location of the stroke rectangle is irrelevant. All cases just give the previous magnification.

Zooming and Views

This Designer Elements program retains the last zoom scale that you set in a particular view. When you zoom in a particular view, change views and zoom in the new view, the view scale in the previous view is not affected.

Panning a View

You may want to move your view around to better see your geometry. This Designer Elements program provides the **Dynamic Pan** tool that enables you to do this without using the scroll bars. Simply hold down the space bar, click on your geometry and drag to the desired location.

View Displays

You have two view types in this Designer Elements program: pre-defined and user-defined. Use these to set the view orientation of your geometry.

Pre-defined Views

This Designer Elements program provides five standard views: Side, Front, Top, Isometric and Trimetric. Each view is defined by Eye Pt locations on the X, Y and Z axes or the Azimuth and Elevation. Changing the values in either Eye Pt or Azimuth/Elevation automatically changes the other fields.

You can change these values as desired. In **File>Preferences>General**, you can set the view definitions to Default or Aerospace. Included with each view is a description based on the view definition and its associated values.

Tech Note:

An azimuth is an angle measured clockwise from the selected point to the vertical.

Side

Default: The view of the y, z plane. The Eye Pt values are: X = 500, Y = 0.0, Z = 0.0. The Azimuth value is 0.0. The Elevation is 90.0.

Aerospace: The view of the x, z plane. The Eye Pt values are: X = 0.0, Y = -500.0, Z = 0.0. The Azimuth value is 0.0. The Elevation is 90.0.

Front

Default: The view of the x, z plane. The Eye Pt values are: X = 0.0, Y = -500.0, Z = 0.0. The Azimuth value is 0.0. The Elevation is 90.0.

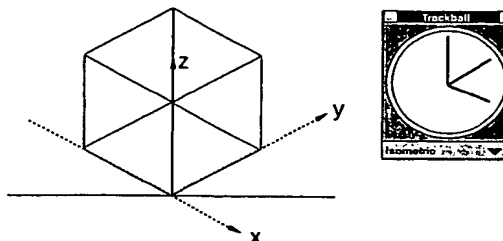
Aerospace: The view of the y, z plane. The Eye Pt values are: X = -500.0, Y = 0.0, Z = 0.0. The Azimuth value is 0.0. The Elevation is 90.0.

Top

Default & Aerospace: The view of the x, y plane. The Eye Pt values are: X = 0.0, Y = 0.0, Z = 500.0. The Azimuth value is 0.0. The Elevation is 0.0.

Isometric

The view of the axes is rotated as shown.

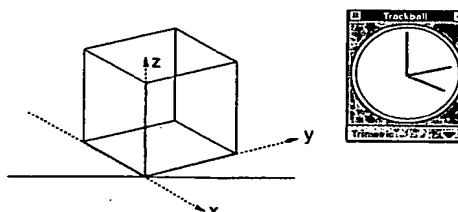


Default: The Eye Pt values are: $X = 500.0$, $Y = -500.0$, $Z = 500.0$. The Azimuth value is -45.0 . The Elevation is 54.736 .

Aerospace: The Eye Pt values are: $X = -500.0$, $Y = -500.0$, $Z = 500.0$. The Azimuth value is -45.0 . The Elevation is 54.736 .

Trimetric

The view of the axes rotated as shown.



Default: The Eye Pt values are: $X = 382.176$, $Y = -256.20$, $Z = 195.712$. The Azimuth value is -33.837 . The Elevation is 66.957 .

Aerospace: The Eye Pt values are: $X = -382.176$, $Y = -256.20$, $Z = 195.712$. The Azimuth value is -33.837 . The Elevation is 66.957 .

User-defined Views

You have the ability to define any new view using the *New View* command or the Trackball. You also have the ability to modify these views using the *Modify View* command.

User-defined Views are saved with the current file. They are not saved as defaults for the program.

New View Command

The *New View* command, located in the View menu, allows you to specify a new view based on a current view or entirely independent of any of the available views.

Choosing the *New View* command brings up the dialog box and contains the following options:

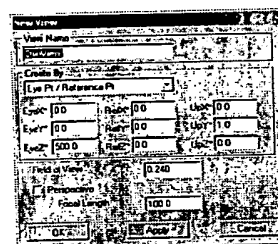
View Name

Contains the name of the current view.

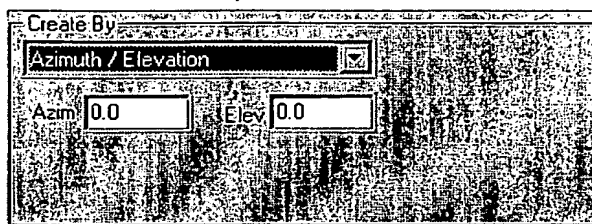
Create By

This field includes a pull-down menu allowing you to choose how to specify your new view; *Eye Pt/Reference Pt*, *Azimuth/Elevation* and *Rotate Current View*.

Eye Pt/Reference Pt - Allows you to create a view based two sets of values. The *Eye Pt* refers to the location of the viewer's eye. The *Reference Pt* refers to an existing point on a model. An asterisk next to the fields denotes your ability to click the location in the drawing area and have the values automatically entered in the fields.



Azimuth/Elevation - Allows you to specify angle of the azimuth and the elevation of your eye with respect to the view.



Rotate Current View - Allows you to rotate the current view by a specified amount. The values entered in these fields affect the related fields in the other *Create By* options.



OK

Click this button to save the new view and close the dialog box.

Cancel

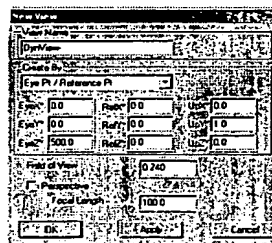
Click this button to close the dialog box without saving the view.

Specifying a View with the New View Command

1. Choose **View>New View**.

The New View dialog box displays the name and location of the current view with its corresponding values. The View Name is highlighted.

2. Enter the new name for the view.
3. Select one of the *Create By* methods for defining your view.



Viewing Geometry

4. Enter the appropriate values according to the *Create By* option you choose.
For the *Eye Pt/Reference Pt* method, you can also click the appropriate points in your drawing and the values will be entered automatically into the data fields.
5. Click OK. The dialog box closes and the new view is defined. (Click Cancel to close the dialog box without saving the view.)

Once you create a new view, you can select it by choosing **View>User View** and the view name or choosing the view in the Trackball pull-down menu.

Be aware that simply rotating the view does not alter the orientation of the work plane in 3D space (except for the Side, Front and Top views).

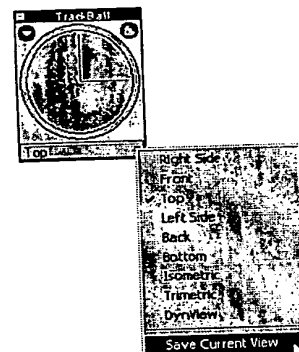
Tip:

If you change a view of your geometry but make no changes to your geometry, the *Save* command is unavailable. To save the view, create an object and then delete it. The *Save* command is now available and can be used to save your view with the file.

Trackball - Save Current View

You can also define a view using the Trackball command, *Save Current View*, at the bottom of the Trackball pull-down menu.

1. Display the Trackball.
2. Rotate your view as desired.
3. Click the view name on the Trackball to display the pull-down menu.



4. Select *Save Current View* and release the mouse.
The new view saves.

When you display the pull-down menu again, your new view is listed as *User View1*.

You will also see the addition of a *DynView*, which is the current non-standard view.

All views defined in this way are numbered sequentially. You can rename these views by choosing **View>Modify View**.

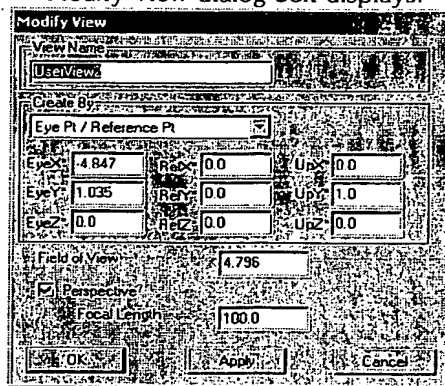
Modifying a View

You can only modify User-defined views. You cannot modify a standard view. An attempt to do so creates a duplicate of the view except for the changes you made. This new view becomes a User-defined view which you can rename as desired. If you choose **View>User View**, the modified view will be displayed.

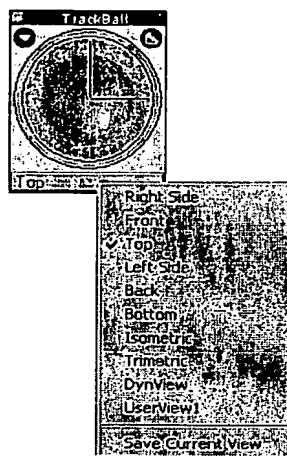
To change the name or any coordinate locations for user-defined views, use the *View Properties* command in the View menu

Using the Modify View Command

1. Choose **View>View Properties** and select the view you want to change. The Modify View dialog box displays.



This dialog box is identical to the New View dialog box except for its title.

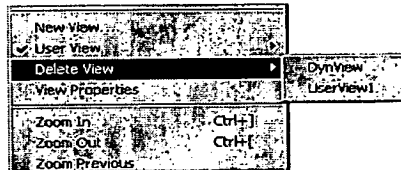


Viewing Geometry

2. Make all of the desired changes in the appropriate fields. (See the New View section earlier in this chapter for an explanation of the data fields.)
3. Click OK. The dialog box closes and the new view is defined. (Click Cancel to close the dialog box without saving the view.)

Deleting a View

You can delete any DynViews or user-defined views using the *Delete* command in the View menu. Choose **View>Delete View** and the view you want to remove.



You cannot delete the current view or the standard views. This command is unavailable if there are no user-defined views.

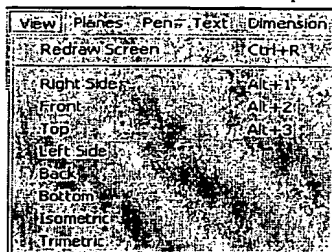
View Rotation

You can choose views in a number of ways:

- Choosing a standard view from the View menu or the Trackball
- Choosing a user-defined view from the View menu or the Trackball
- Choosing an undefined view by rotating the Trackball
- Using the Dynamic Rotation tool
- Using the SHIFT and Arrow keys

Choosing a Predefined View

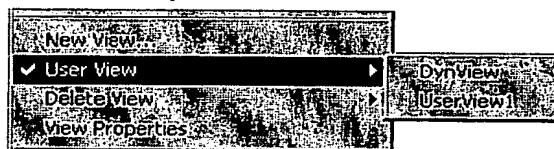
To use any of the five standard views mentioned earlier choose one in the View menu or in the Trackball pull-down menu.



See Chapter 7 for more information on using the Trackball.

Choosing a User-defined View

To use any of the user-defined views, choose one in the *User View* submenu of the View menu or in the Trackball pull-down menu.



The *User View* command in the View menu is not available when no user views have been defined.

Choosing an Undefined View

You can choose undefined views by using the Trackball to rotate the view to a new orientation.

Notice that when you rotate the view with this method the view name changes to DynView. This view has been added to your Trackball pull-down menu and is a temporary view that will change as you rotate your view using the Trackball. One advantage of this feature is that you don't have to define this view but it will still be available to you until the next Trackball rotation.

Viewing Geometry

Dynamic Rotate Tool

The Dynamic Rotate tool, located in the View tool palette, allows you to rotate your view dynamically around any axis.



1. Select the Dynamic Rotate tool. The Message Line reads: *Dynamic Rotate: Drag mouse to rotate view.*

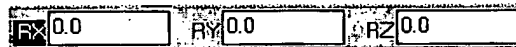


The cursor becomes a plus (+) sign.

2. Drag your cursor to change the view.

or

Enter values in the Status Line if you want the view to rotate a specified angle.



Press ENTER (Windows) or RETURN (Macintosh) and the view changes.

Using the Shift and Arrow keys

In any view you can hold down the SHIFT key and use the arrow keys to rotate your view.

View Commands

Redraw Screen - CTRL+R (Windows); z +R (Macintosh)

This command in the View menu refreshes the screen. When you make changes to your constructions the geometry may not be redrawn cleanly.

Redrawing the Screen

To redraw all of the geometry and remove extraneous geometry choose the *Redraw Screen* command from the View menu.

Stopping a Screen Refresh

Windows. You can press the ESC or BREAK key to stop the redrawing of the screen. For interrupting long operations such as redraw or linear and polar duplicate, use the BREAK key. If the operation was initiated by a Control key command (such as

CTRL+R for redraw) the ESC key is read by MS-Windows and it brings up a task list at the end of the operation.

Macintosh: You can press ESC or the z (Command) key to stop the redrawing of the screen.

View the Plane

This command located in the View menu, changes the view to your current work plane.

Show/Hide

This command in the Window menu helps you manage the display of objects in your drawing.

You can choose which objects display at a given time. When you choose **Windows>Show/Hide**, the following list of commands appears.



Using the Hide Command

1. Select the *Hide* command. The Message Line reads: *Select entities to hide [Shift = Extend]*.
2. Select an object. The object hides from view.

Using the Show Command

1. Select the *Show* command. The Message Line reads: *Select entities to show [Shift = Extend]*.
2. Select an object by clicking on the approximate location of the object or using a selection fence. The object shows on the screen.

Using the Show ALL Command

Select the *Show ALL* command to display all objects on active layers in your drawing.

Using the Invert Command

Select on the *Invert* command to display all object currently hidden and hide all objects currently displayed.

Viewing Geometry

Using the Show Only Command

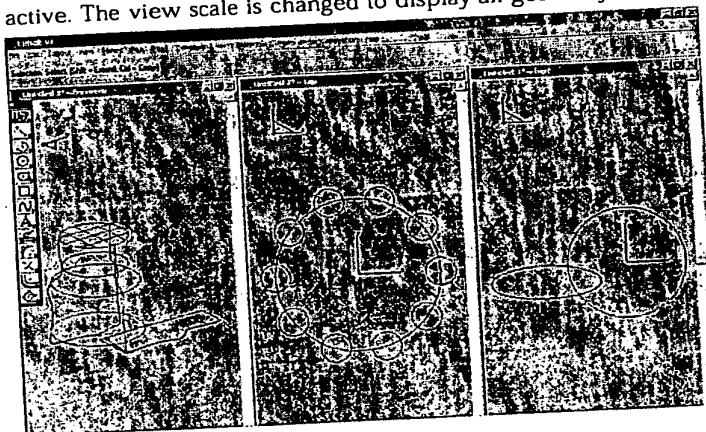
1. Select the *Show Only* command. The Message Line reads: *Select entities to show only [Shift = Extend]*.
2. Select the object that you want displayed. Hold down the SHIFT key to select more than one object.
All other objects in your drawing are hidden.

Tile

In some cases you may find you have multiple files open at the same time. Rather than having to switch back and forth between them, you can choose to display them all at once. In the Windows menu you have two commands to accomplish this: *Tile Vertically* and *Tile Horizontally*. (Windows Only)

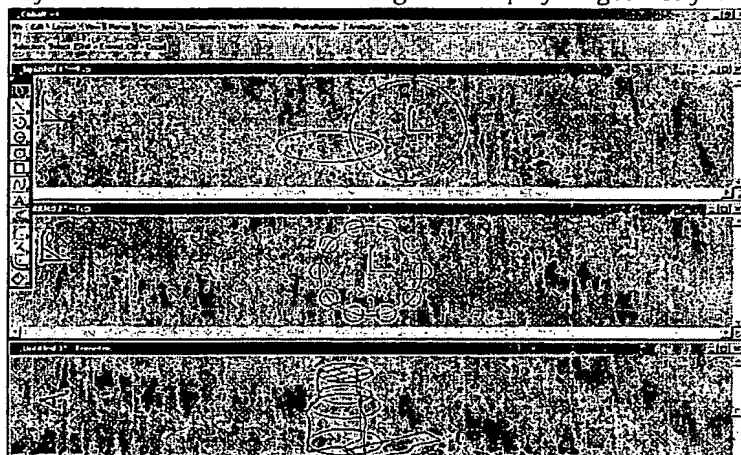
Tile Vertically

This command resizes the window for each file equally and arranges them vertically across your screen. The files are arranged left to right starting with the file most recently active. The view scale is changed to display all geometry in each file.



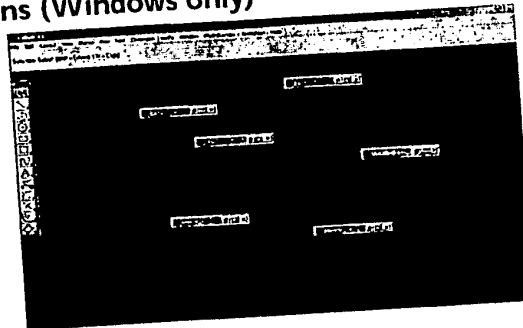
Tile Horizontally

This command resizes the window for each file equally and arranges them horizontally down your screen. The files are arranged top to bottom starting with the file most recently active. The view scale is changed to display all geometry in each file.



Clicking on the Maximize button at the top right of your screen, resizes the selected file to full screen.

Arrange Icons (Windows only)



On occasion you may have many open files reduced to their title bars but arranged haphazardly around your screen.

Choose **Window>Arrange Icons** and your files will be neatly arranged in the lower left corner of your screen.

Open File Windows

The bottom of the Window menu shows the names of all the open this Designer Elements program files. To bring a different document to the top choose it from the list.

Views and Planes

When you want to view geometry in this Designer Elements program, you choose a particular view orientation as discussed in this chapter. When you want to create geometry you choose a particular plane on which to draw.

To eliminate the potential confusion between work planes and view, this Designer Elements program has tied the Front, Side and Top views to their respective planes. For example, if you choose the Top view, the Top plane is selected in the Plane menu and all other planes are grayed out. See Chapter 32 for more information about Planes.

Views and Zoom Scale

this Designer Elements program has linked the view to the zoom scale. Each view remembers the last zoom scale set in that view. You can change the view and alter the zoom scale and it won't affect the zoom scale of any other view.

Example: In the Top view set the zoom scale to 1:2. Choose the Isometric view and change the scale to 1:4. Return to the Top view and the scale returns to 1:2.

Viewing Geometry

30-20

Layers

You can think of visible layers as transparent pages and hidden layers as invisible pages. You can use layers to show and hide various components of your drawing. They are particularly useful in helping you view and print complex drawings. For example, when you dimension a part, the dimensions can be placed on a separate layer which you can display or not, as your needs require. Layers allow you to print different versions of the same document.

- You can hide the dimension layer to present a design to a planning team and show the dimensions when presenting the drawing to engineers.
- You can hide some drawing components when you print or plot. For example, you can hide the construction layer so that construction lines and geometry don't print but remain in the drawing ready for use when you want to alter them.
- You can construct different layouts using one layer as the basis. For example, you can use one layer to define the basic shape of an object and then use other layers to try different methods of detailing.

In this Designer Elements program you can have up to *65,000* layers in your drawing. Layers must be visible to select objects on them. Layers do not have an orientation or origin in this Designer Elements program.

The topics explained in this chapter include:

- Layer Manager
- Creating New Layers
- Creating New Sub Layers

Layers

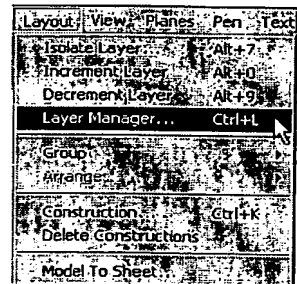
- Renaming Layers
- Deleting Layers
- Hiding Layers
- Displaying Layers
- Locking Layers
- Unlocking Layers
- Making a Layer the Active Work Layer
- Layers and Colors
- Layer and Copying/Pasting Objects

Layer Manager-CTRL+L(Windows); ⌘ +L(Macintosh)

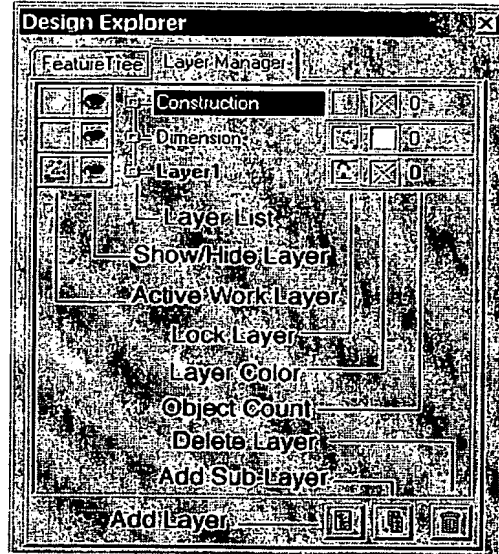
The Layer Manager allows you to create, delete, hide, display and rename layers, as well as set layer specifications. The work layer is the active layer—on which geometry is created. There are Three ways to open the Layer Manager.

The Layer Manager dialog box is integrated with the Design Explorer dialog box.

1. Open the Design Explorer (**Window>Design Explorer**)
2. Choose **Layout>Layer Manager**.
3. Click on the **Work Layer Indicator** to display the pop-up menu and choose the **Layer Manager** command



The Layer Manager dialog box appears.



The Layer Manager contains the following elements

Active Work Layer This column sets your active work layer. To change your active work layer move the pencil icon to the layer you wish to add geometry to.

Layer list The Layer list displays all layers in the file.

Layer-Show/Hide This column shows whether a layer is visible or hidden. You cannot hide the active work layer. If the Layer icon (see below) displays, a layer is visible (on).



Layer Lock If this column contains a lock icon (see below) next to a layer, the layer is locked.



Layers

Layer Color

Objects on this layer cannot be selected or modified.

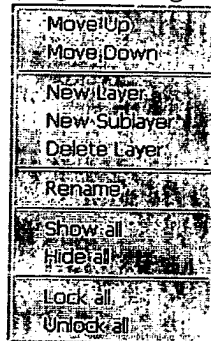
This column sets the color for all objects on a layer.

The original colors of objects are retained but they are displayed in the layer color as it takes precedent.

Object Count

This column displays the number of objects on the layer.

By right clicking on a layer the following menu box pops up:



Move Up

Choosing this option moves the selected layer up one position in the dialog box.

Move Down

Choosing this option moves the selected layer down one position in the dialog box.

New Layer

Choosing this option adds a new layer to the layer list. Layers are numbered sequentially, Layer 1, Layer 2, etc. This option also has a button at the bottom of the Layer Manager dialog box.



New Sublayer

Choosing this option adds a sublayer to the selected layer. These layers are controlled by their parent layer. If you show/hide the parent the sublayer responds in kind. This option also



Delete Layer

has a button at the bottom of the Layer Manager dialog box.

Choosing this option deletes the selected layer. You cannot delete the active work layer. This option also has a button at the bottom of the Layer Manager dialog box.



Rename

Choosing this option lets you rename the highlighted layer. You may also click twice on a layer name, once to select the layer and the second time to rename it.

Show All

Choosing this option shows all layers.

Hide All

Choosing this option hides all layers except the active work layer.

Lock All

Choosing this option locks all layers including the active work layer.

Unlock All

Choosing this option unlocks all layers.

Default Layers

When you open a new drawing the default layers include: *Construction*, *Dimension* and *Layer 1*.

Construction

This layer automatically accepts all Construction lines created with stroke commands or with the Construction dialog box. If you accidentally delete this layer, it automatically recreates when you create a construction line.

Dimension

Dimensions are normally placed on the layer you select from the Layer list of the Dimension menu. The default layer is the Dimension layer. Generally, this layer should be reserved for dimensions.

Tech Note:

Dimensions placed in drawing views go on the Sheet View layer. See Chapter 36 for more information.

Layer 1

This layer is the current work layer for new files. If the file only contains the default layers all geometry will normally be placed on Layer 1.

You can edit any geometry or text that is visible regardless of its layer. If you want to make some geometry unselectable but still visible use the *Select Mask* in the Win-

Layers

dow menu or lock the layer containing the geometry. You can also specify the selectability of layers with the *Select Mask*.

Creating New Layers

There are three ways you can create a new layer: using the Layer Manager, the Work Layer Indicator or the *Isolate Layer* command.

Using the Layer Manager

Tip:

If the Selection Mask is open and you add a new layer, the Selection Mask automatically updates.

1. Display the Layer Manager dialog box.
2. Click the new layer button. A new layer is added to the layer list.

You may name the layer by clicking twice on the layer name, once to select the layer and the second time to rename it. You can have as many as 32,700 layers.

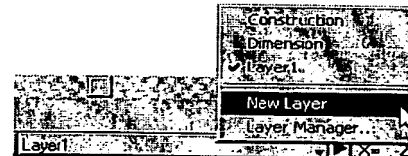
3. The new layer is added.



Using the Work Layer Indicator

1. Click on the Work Layer Indicator to display the pop-up menu.
2. Choose the *New Layer* command.

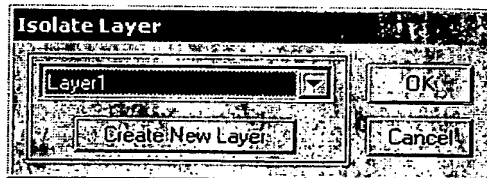
A new layer is created and automatically set as the active work layer.



Using the Isolate Layer Command - Alt+7 (Windows); z +7(Macintosh)

1. Choose *Layout>Isolate Layer*.

The Isolate Layer dialog box appears.



2. Click Create New Layer.

A new layer is created and the name is placed in the entry field.

3. Click OK to close the dialog box and save the new layer. The layer is now the active work layer and all other layers are hidden.

Renaming Layers

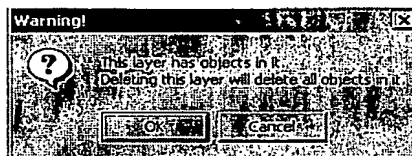
1. Display the Layer Manager dialog box.
2. Click twice on the layer you wish to rename, once to select the layer and the second time to rename it.

Deleting Layers

1. Display the Layer Manager dialog box.



2. Select the name of the layer from the list box.
3. Click on the trash can in the lower right corner of the dialog box. The layer is deleted.
4. If the layer contains any geometry on it a warning appears.



Click OK to delete the layer or Cancel to close the warning box without deleting.

Hiding Layers

You can hide one layer at a time or all layers but the active work layer.

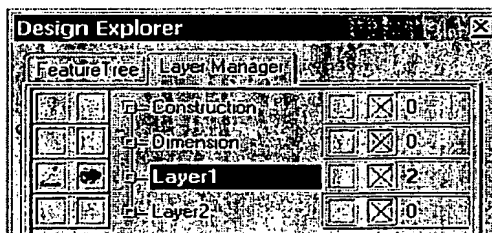
Hiding One Layer

1. Display the Layer Manager dialog box.



2. Click on the "eye" icon to the right of the layer name that you want to turn hide.

The eye icon disappears and the layer is now hidden.



Hiding all Layers

1. Display the Layer Manager dialog box.
2. Right click on a layer name and choose **Hide All**.
3. Close the Layer Manager dialog box.

Notes:

- You can't hide the active work layer
- If a layer is hidden and you choose *Select All* and delete, the objects on the hidden layer are not deleted.

Showing Layers

You can turn on one or all layers in your drawing.

Showing One Layer

1. Display the Layer Manager dialog box.
2. Click the box to the left of the layer name that you want to turn show.
An eye icon appears next to the layer's name in the list.

Showing all Layers

1. Display the Layer Manager dialog box.
2. Right click on a layer name and choose **Show All**.

Locking Layers

1. Display the Layer Manager dialog box.
2. Click in the *Lock Layer* column next to the desired layer and the lock icon appears.



The layer locks.

Unlocking Layers

1. Display the Layer Manager dialog box.

2. Click on the lock icon in *Lock Layer* column next of the desired layer. The lock icon disappears and the layer unlocks.

Making a Layer the Active Work Layer

You have number of ways to make a layer the active work layer. These include: using the Layer Manager, the Work Layer Indicator, the *Isolate Layer* command, the *Increment Layer* command or the *Decrement Layer* command.

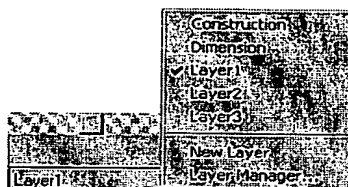
Using the Layer Manager

1. Display the Layer Manager dialog box if it is not already displayed.
2. Click in the *Work Layer* column to the left of the desired layer.
The selected layer becomes the work layer as shown by the pencil icon.
3. Close the dialog box and save the change.



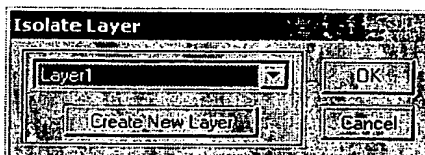
Using the Work Layer Indicator

1. Click on the Work Layer Indicator to display the menu.
2. Select the layer you want to make the active work layer
The layer you selected is now the active work layer.



Using the Isolate Layer Command - Alt+7 (Windows) z +7 (Macintosh)

1. Choose *Layout>Isolate Layer*.
The Isolate Layer dialog box appears.
2. Click on the arrow in the Layer entry field to display all available layers.
3. Select the desired layer.
4. Click OK to save this layer as the work layer and close the dialog box. All other layers are hidden.



Increment Layer - ALT+0 (Windows); z +0 (Macintosh)

Choosing this command in the Layout menu makes the next layer in the Layer Manager dialog box the active work layer and hides all other layers. You cannot use this command if your active work layer is the last layer in the list.

Decrement Layer - ALT+9 (Windows); z +9 (Macintosh)

Choosing this command in the Layout menu makes the previous layer in the Layer Manager dialog box the active work layer and hides all other layers. You cannot use this command if your current work layer is the first layer in the list.

Layers and Color

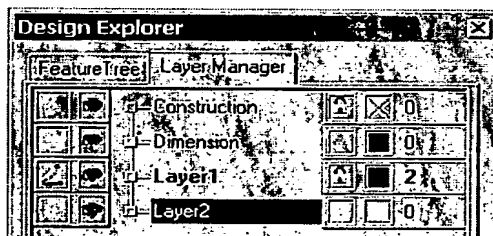
This Designer Elements program provides the ability to choose a color for all objects on a layer. You have nine color options: white, red, blue, green, cyan, gray1, purple, yellow and gray2.

Objects created on this layer use the current pen color but are displayed in the layer color.

Objects created on another layer and in another color placed on this layer have their color display overridden. They retain their original color but display in the layer color. If the object is moved to another layer with no color override, it displays in its own color.

Using the Layer Color Override

1. Display the Layer Manager dialog box if it is not already displayed.
2. Click in the *Layer Color* column next to the desired layer. A color patch appears displaying the first color available, white.

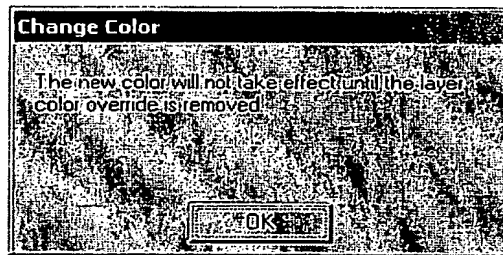


3. Click on the color patch to advance to the next patch color.
4. Select the desired color for the layer.

5. Click OK to close the dialog box and save the change.

Layer Color Warning

This Designer Elements program provides you with a Layer Color warning if you attempt to change the color of an object on a layer with a specified color. The following Change Color box appears:



As the box indicates, you cannot change the color unless you remove the color override for that layer.

Layers and Copying/Pasting Objects

When you copy objects on a specific layer in one file into another file containing those same layers, the objects are not automatically placed on the specific layer. The copied objects are placed on the work layer.

Layers

31-12

Planes

A plane is an infinite surface on which you can create geometry. This Designer Elements program provides predefined planes, Front, Side and Top and the ability to create user-defined planes.

If a plane is chosen as the *work plane*, all geometry created from that point on is placed on that plane. The work plane is an x, y plane with an origin of 0, 0, 0 for all data input. You can move the work plane as desired by creating your own or choosing one of the predefined planes.

As you learn to use this Designer Elements program, you should attempt to use the Z-Drafting Assistant without moving the work plane. Even though the Z-Drafting Assistant does a lot of the work for you the work plane is still an essential element of 3D modeling.

The Z-Drafting Assistant assumes that geometry is being created in the current work plane unless it snaps to an *align:z* or to a logical snap point that is not in the current work plane.

You will need to use a work plane to properly position geometry in the following cases:

- To create geometry that is not parallel to the work plane and does not snap to one of the Drafting Assistant's constraints like endpoint or midpoint.
- To create geometry that requires less than three points for their specification such as the Center-Point Circle, Rectangle or 2-Point Ellipse.

Referral:

Planes can also be created by using the **Infinite Plane** tool in the **Surfaces** tool palette. See Chapter 16 for more information.

Planes

Those tools which use three points for specification can be drawn non-parallel to the work plane.

The Plane menu and the Work Plane Manager, accessed through the coordinate system axis, contain all of the commands for creating and setting the work plane.

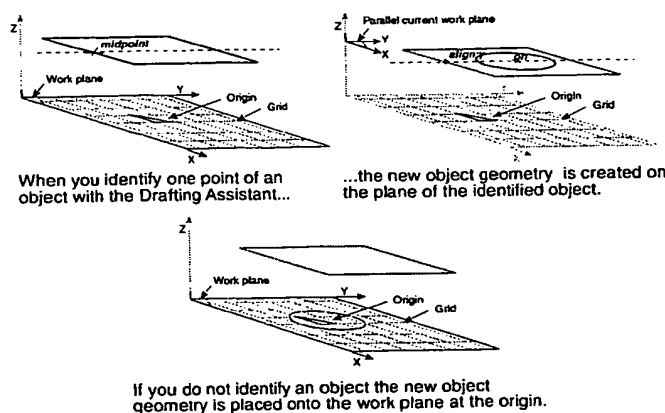
The topics explained in this chapter include:

- Work Plane
- Work Plane and Views
- Work Plane and World Coordinates

Work Plane

The work plane is an important feature of any CAD program. In conventional CAD programs you have to specify both the orientation of the work plane and its exact location along the z-axis.

In this Designer Elements program you need only specify the orientation of the work plane. Once that is done, all parallel planes act equally as the current work plane (e.g. the Drafting Assistant identifies the location of the work plane automatically).



Another way to explain the relationship presented in the graphics above is to remember the role of the Drafting Assistant. For new geometry to be placed on the same plane as another piece of geometry either create a user-defined work plane at that location or brush over that "old" geometry to wake up one of its control points like midpoint or endpoint. This Designer Elements program will then retain this plane information as you create the new geometry.

If no object exists or no geometry is referenced for plane information this Designer Elements program places the new object geometry onto the work plane.

Show Work Plane Command

Choosing this command in the Plane menu displays the work plane icon in your drawing. The left graphic below shows the work plane icon in the Top plane. The right graphic shows the icon in the Isometric view.



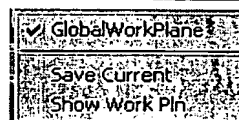
The work plane icon is a helpful reference for creating geometry on multiple planes.

Work Plane Manager

The work plane manager, accessed through the coordinate system icon in the Status Line, is a menu of commands that allow you to define, delete, display the properties of and save the current work plane. It also allows you to show or hide the work plane.

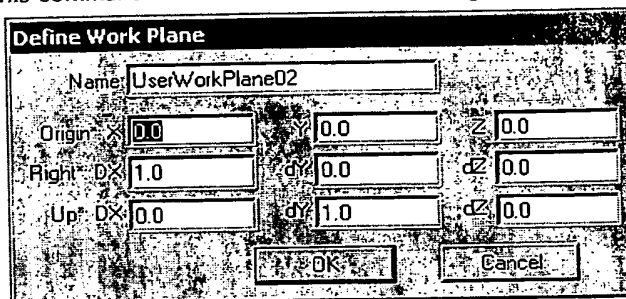
Display this menu by clicking on the coordinate system axis icon to the left of the Status Line.

The work plane manager menu displays.



New Command

This command, found in the Planes Menu (*Planes>New Work Plane*) allows you to define a new work plane. You can define an unlimited number of planes. When you choose this command the Define Work Plane dialog box appears.



The dialog box contains the following items.

Name	Displays the work plane name. If you have not entered a unique name, the name field displays UserWorkPlane01 or some other numbered increment.
Origin	These fields display the X, Y and Z coordinates for the origin of the work plane.
Right	These fields display the DX, DY and DZ coordinates for the right arm of the work plane.
Up	These fields display the DX, DY and DZ coordinates for the up arm of the work plane.

The asterisk (*) next to the field indicates your ability to specify locations by clicking in the drawing area. You can also enter the values manually.

Using the New Command to Define a Work Plane

1. From the work plane manager menu, choose *New*.

The Define Work Plane dialog box appears.

2. Enter the values for the origin, right and up arms of the work plane. You can also specify the locations by clicking in the drawing area.
3. Enter in name for the work plane in the Name data field.

If you don't enter a name, the default name displayed in the field will save with the work plane coordinates.

4. Click OK to save the new plane.
5. Display the work plane manager menu again.

Notice that the new work plane is listed and is the current work plane. You are now operating in the user-defined coordinate system.

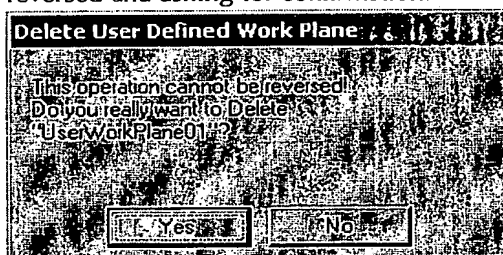
Referral:

See Chapter 7 for information on coordinates systems.

Delete Command

Use this command, located in the Planes Menu (**Planes>Delete Work Plane**) to delete a user-defined work plane. You cannot delete the GlobalWorkPlane or Dyn-WorkPlane items.

1. Select the user-defined work plane you want to delete.
2. Choose the *Delete* command. A warning box appears explaining that the operation cannot be reversed and asking for confirmation.



3. Click Yes to delete the plane.

Properties Command

This command displays the properties of the selected work plane.

1. Choose a user-defined work plane.
2. Choose the *Properties* command. The Define Work Plane dialog box appears displaying the name and the X, Y, Z coordinates of the work plane.
3. Change any value and click OK to close the dialog box and save the changes.

Planes

Save Current Command

This command saves the current work plane and adds it to the list of work planes in the Work Plane manager. It is automatically titled with the next available default label. If there are no other user-defined planes using a default label, the plane is titled, *UserWorkPlane01*.

You can rename this plane by selecting the name and choosing the *Properties* command in the Work Plane manager.

Show Work Pin Command

This is the same command available through the Planes menu. Choosing the command displays the work plane icon in your drawing.

Work Plane Identification

You can determine if your current work plane is global or user-defined through the coordinate system/work plane icon displayed to the left side of the Status Line.

The Global Work plane icon is a miniature version of the axis icon.



When a user-defined work plane or dynwork plane is chosen, an altered axis icon displays in the Status Line, as shown here.

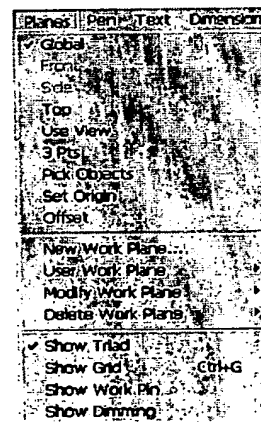


Setting the Work Plane

In the Planes menu you have commands for setting the work plane. You may want to define a work plane other than the standard planes. For example, if you want to work on an angled face, you can reorient the work plane.

You can set the work plane six ways. From the Planes menu, choose a predefined plane, Front, Side or Top or use one of these commands, *Use View*, *3 Pts*, *Pick Objects* and *Define*. As explained earlier, you can also define and set the work plane using the work plane manager menu.

Work planes created using the *Use View*, *3 Pts*, *Pick Objects* and *Define* commands do not save for use later. They are only available until you set another work plane. Use the *New* command in the work plane manager to define and save a work plane with your file. If you have created objects on a tem-



Tech Note:

If you are in the Front, Side or Top view, the work plane is already set to the respective plane and the other two predefined planes in the Plane menu are unavailable.

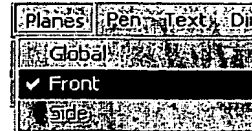
Temporary planes created with the *User View*, *3 Pts*, *Pick Objects* and *Define* commands are not saved for future use.

porary work plane, you can use the *Pick Objects* command and select the objects on that plane to set the work plane to them. (See a later section on using the *Pick Objects* command.

Choosing a Predefined Plane

1. Click or drag on the Plane menu to display the submenu.
2. Select one of the predefined planes.

All three predefined planes are only available when your view is set to Isometric, Trimetric or a User-defined view.



The work plane has changed to the selected plane.

Choosing the Front plane sets the x-axis to 0, 1, 0 and the y-axis to 0, 0, 1. Choosing the Side plane sets the x-axis to 1, 0, 0 and the y-axis to 0, 0, 1. Choosing the Top plane sets the x-axis to 1, 0, 0 and the y-axis to 0, 1, 0.

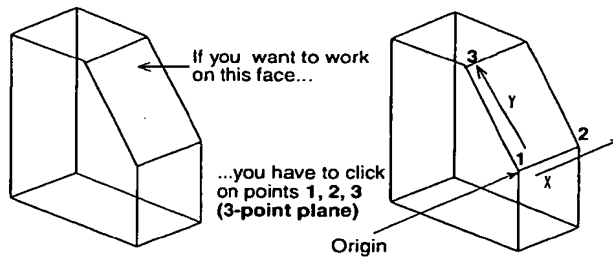
Choosing the Use View Command

This command sets the work plane to be coincident with the screen; the origin is in the center of the screen; the x-axis is coincident with the width of the screen; the y-axis is coincident with the height of the screen.

This sets the plane to match the screen in all views which is particularly useful when you are moving from view to view while drafting.

Choosing the 3 Pts Command

This command sets a temporary work plane from the three points you specify. This command is especially helpful if you want to create non-parallel planes.



1. Choose **Plane>3 Pts**. The Message Line reads: *Work Plane: Enter three points for work plane (1 origin, 2 x-axis, 3 y-axis).*

Referral:

See Chapter 15 for information on using the **Infinite Plane** tool.

Planes

2. Click in the drawing area to indicate the origin point for the new work plane.
 3. Click a point to define the positive x-axis.
 4. Click a point to define the positive y-axis.
- A temporary work plane is created.

Choosing the Pick Objects Command

This command allows you to set the work plane based on selected objects. This includes selecting an infinite plane icon.

1. Choose **Planes>Pick Objects**. The Message Line reads: *Work Plane: Select objects to set Work Plane [Shift = Select]*.
2. Select a curve or curves located in the plane that you want to set as the work plane.

The work plane changes to the plane of the objects. Choose **Plane>Show Work Pln** to verify that the new plane is selected.

You can also use this tool to set the work plane to the face of a solid object.

Using the Work Plane Manager to set the Work Plane

1. Click on the work plane icon at the left of the Status Line.
2. From the menu select a work plane. (This menu displays the global work plane and any user-defined work planes.)

The selected work plane is now set.



Work Plane Snapping

A short cut was added to allow rapid work plane positioning and alignment. This has been accomplished by further integration of the work plane with the Drafting Assistant. By default the short cut is set to the "c" key. When you hit the short cut key associated with work plane snapping you will see the following behavior:

- Work plane origin moves to drafting assistant snap location. Aligns to top plane.
- Second "c" hit changes from top to side work plane orientation.
- Third "c" hit changes from side to front work plane orientation.
- Fourth "c" hit changes from front to use view work plane orientation.
- Fifth "c" hit changes from use view back to top plane.

Tech Note:

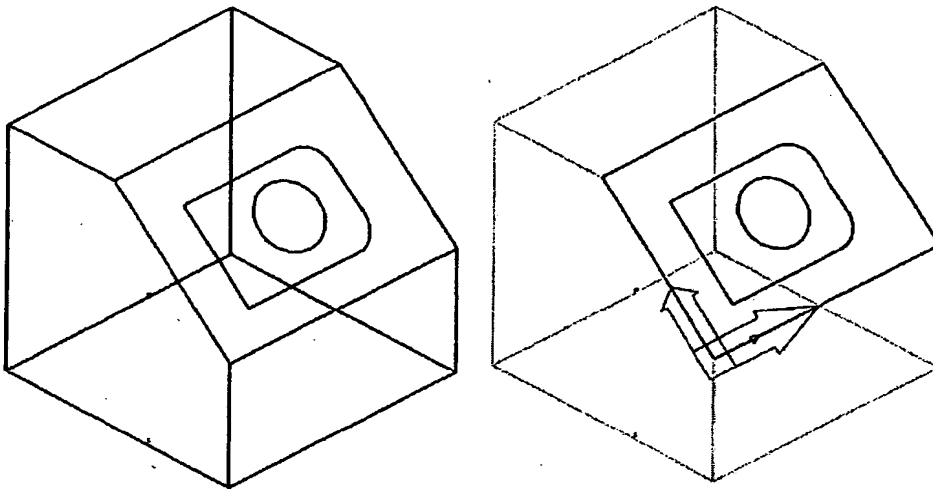
This tool does not create a plane between curves on different planes. It only sets the plane to objects already in a plane.

If you have the face snap options on, hitting the short cut key will automatically align with respect to the face normal.

Note: you must have an object selected in order for the work plane snapping short cut to work.'

Work Plane Dimming

This menu command provides a means to dim objects that do not lie in the work plane.



Moving the Origin

Occasionally, you may simply want to move the origin of the work plane. This is especially useful for measuring distances. For example, you can open a document and start drawing without regard to the location of the origin, then move the origin to a convenient location for future reference.

Set Origin

This command sets a new origin in the current work plane.

Specifying a New Origin

1. Choose **Planes>Set Origin**.

2. Click in the drawing area to indicate the location for the new origin.

The origin of the current work plane moves but the orientation of x, y, z remains the same.

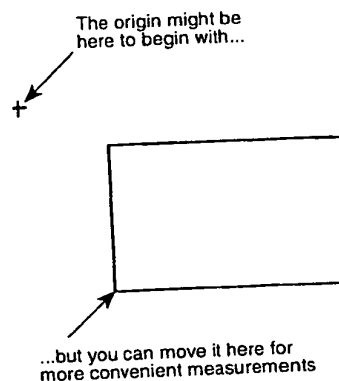
If you want to move the origin and change the orientation of the work plane, use either the *3 Pts* command or the *Define Plane* command.

Offsetting the Work Plane

As you're using this Designer Elements program, you may want to move the work plane a certain distance normal to the current work plane so that new geometry will snap to it. The *Offset* command in the *Planes* menu gives you this ability.

Using the Offset Command

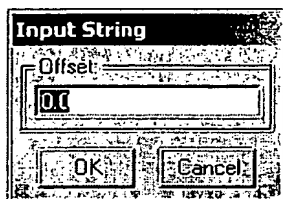
1. Display the work plane icon. (This is not required but it will help you visualize the offset.)
2. Choose **Planes>Offset**.



Tip:

Use the *3Pts* command in the *Planes* menu if the new plane is not parallel.

The following dialog box displays.



3. Enter the distance to offset (negative or positive) the work plane in the data field. The units for the distance are based on the *Units* page of Preferences.
4. Click OK to accept the value and close the dialog box.

The work plane has changed. Click Cancel to close the dialog box without accepting the value.

Work Plane and Views

Standard Views

When you want to create geometry you choose a particular plane on which to draw. When you want to view geometry in this Designer Elements program, you choose a particular view orientation.

To eliminate the potential confusion between work planes and views this Designer Elements program has tied the Front, Side and Top views to their respective planes. For example, if you choose the Top view, the Top plane is selected in the Plane menu as the work plane and all other planes are unavailable.

See Chapter 30 for more information about Views.

View the Plane

This command in the View menu changes the view to the current work plane.

Work Plane and World Coordinates

This Designer Elements program uses the world coordinate system (as opposed to the User Coordinate System) for defining planes.

Planes

32-12

Rendering

After you create your geometry you can render it to display it more realistically. This Designer Elements program includes functionality for basic and advanced rendering. Basic rendering allows you to visualize and construct your model in various display modes. Advanced rendering allows you to create photorealistic images.

The topics covered in this chapter include the following:

- Lighting
- Basic Rendering
- Advanced Rendering
- Editing the Rendered Scene
- Photorealistic Rendering
- Animation
- Perspective Rendering

Tip:

When rendering geometry increasing the resolution on solid objects can improve the final image. This is especially helpful for round parts.

Lighting

When you render your model this Designer Elements program automatically provides default lights to display your objects. This Designer Elements program also allows you to design your own lighting using four types of light sources: three directional sources (distant, spot and point) and the ambient light source. Use these lights to define the lighting characteristics of the model.

Directional Lighting

The distant light source, spot light source and point light source are directional sources. For each source you specify its location and direction. You place these lights in your drawing by using the Light tool palette.

These light sources also support shadows when working within the advanced rendering environment.

Light Palette

The Light tool palette does not automatically display when you launch this Designer Elements program. To display the palette choose **Window>Lights**.



The Light tool palette includes the Distant Light (☀), Spot Light (🔦) and Point light (💡). Light sources placed using this palette contribute light color and intensity to all objects that lie within their influence and are used to define the light.

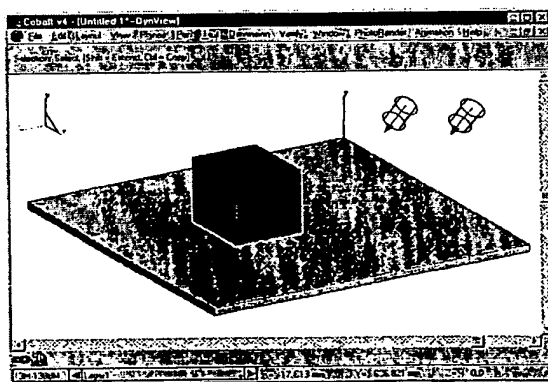
Light sources appear in your drawing as symbols in the wireframe and basic render modes for construction purposes. The light source symbols do not appear when using the photorealistic rendering commands.

Light sources can be hidden using the *Show/Hide* command or moved to a separate layer and hidden. However both actions turn off the light.

Distant Light Source



A distant light source illuminates a scene with parallel rays of light as if they emanate from a very distant light source. Like the sun, this source illuminates all parallel surfaces equally.



Using the Distant Light Tool

1. Select the Distant Light tool. The Message Line reads: *Distant Light: Enter location and direction positions.*
2. Click a point to set the location of the light.
3. Click the next point to establish the direction of the light.



The exact distance is not important. A distant light source symbol appears in your drawing composed of a cylinder with an arrow pointing along the source center-line.

If *Show Points* in the Edit menu is checked the center-line extends from the source location to the direction point, as in the graphic here.



Place more lights as desired. As you add lights you may want to render the model again to verify the lighting effect.

Geometric Characteristics

According to the Edit Objects Geometry page a distant light source is made up of the following characteristics: Type and Intensity. It also includes the Enable Light check box, Cast Shadows check box and its associated pull-down menu and the Cast Volumetric Shadows check box. The Attenuation menu is not available since a distant light source illuminates all surfaces equally.

The Enable Light check box gives you the ability to turn off a light while retaining the intensity, direction and location settings. When checked, the light is on. The default setting is on.

The Cast Shadows check box controls whether a shadow is cast by an object when a particular light is directed towards it. When checked, shadows are cast. When unchecked, no shadows are cast as a result of that light. With its associated pull-down menu, you also have the option of setting the type of shadow casting. You have four shadow type options: hard, medium, soft and blurry.

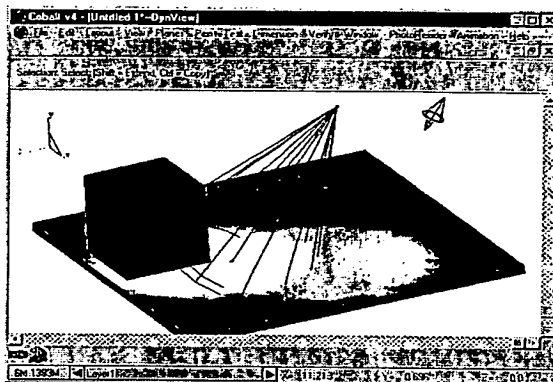
The ability to control shadow casting is especially valuable in a scene containing multiple light sources. Too many shadows can render a scene confusing. This check box setting only applies when rendering your scene with Preview Render (shadows on) or Raytrace Render (shadows on, Anti-Alias). See the "Photorealistic Rendering Commands" section later in this chapter.

The light source color is accessible through the Attributes page.

Spot Light Source



A spot light source illuminates a scene with a cone of light emanating from a local source. This source functions similarly to a flashlight.



Using the Spot Light Tool

1. Select the Spot Light tool.
The Message Line reads: *Spot Light: Enter location and direction positions.*
2. Click the first point to set the location of the light.
3. Click the next point to establish the direction of the light.



Distance is only important if you want to set the light with an attenuation (see the Geometric Characteristics section for information on attenuation). The default setting does not include attenuation. A spot light source symbol appears in your drawing, composed of an inner and outer cone and an arrow pointing along the source center-line.

If *Show Points* in the *Edit* menu is checked, the center-line extends from the source location to the direction point. The sides of the cone extend to a plane normal to the direction, and end at the direction point, as in the graphic here.



Place more lights as desired. As you add lights, you may want to render the model to verify the lighting effect.

Geometric Characteristics

According to the *Edit Objects Geometry* page, a spot light source is made up of the following characteristics: Type, Intensity, Attenuation, Cast Volumetric Shadows, the Cone Angle data field, Falloff Angle data field, Falloff Rate data field and the Slide check box. It also includes the Enable Light check box, Cast Shadows check box and its associated pull-down menu.

The Enable Light check box gives you the ability to turn off a light while retaining the intensity, direction and location settings.

- The Cast Volumetric Shadows check box enables simulation of a full range of effects occurring in a participating medium, i.e. attenuation within the medium, light filtration through a colored medium and first order light scattering inside the medium with volumetric shadows.

The light scattering effects are modeled for all light shaders except "ambient", "eye" and "sky" (though are available in the "area sky" shader). The "first order scattering" mentioned above means that the shader visualizes direct the effect of scattering through the medium, scattered light coming to the observer but does not consider the secondary effect, multiple bounces of light within the medium or illumination of surfaces by scattered light.

- The shader performs attenuation of the original surface color according to given medium attenuation coefficient and medium color. As one could expect the longer the distance from the shaded point, the dimmer and more colored by the medium it becomes. In addition to attenuation it is also possible to specify the medium ambient light scattering, which gives the overall veiling effect. Finally the shader models scattered light from all the supported light sources if the "scattering" parameter of the source is set to TRUE.

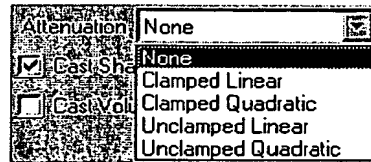
The Cast Shadows check box controls whether a shadow is cast by an object when a particular light is directed towards it. When checked, shadows are cast. When unchecked, no shadows are cast as a result of that light. With its associated pull-down menu, you also have the option of setting the type of shadow casting. You have four shadow type options: hard, medium, soft and blurry. This check box setting only applies when rendering your scene with Preview Render (shadows on) or Raytrace Render (shadows on, Anti-Alias). See the "Photorealistic Rendering Commands" section later in this chapter.

Attenuation Settings

Attenuation controls how quickly the light intensity diminishes with the distance from the light. You have the following attenuation options:

None

Light intensity does not change with distance.



Clamped Linear

Light intensity diminishes according to the following formula, $Intensity / (distance + 1)$.

Clamped Quadratic

Light intensity diminishes according to the following formula, $Intensity / (distance^2 + 1)$.

Unclamped Linear

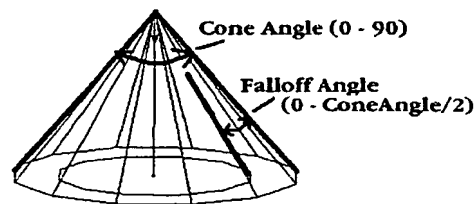
Light intensity diminishes according to the following formula, $Intensity / distance$.

Unclamped Quadratic

Light intensity diminishes according to the following formula, $Intensity / distance^2$.

Use clamped attenuations in situations where the distance from a light source to an object is less than one 1" (25.4 mm). Clamped attenuations do not increase intensity when the distance is less than 1" (25.4 mm). Unclamped situations are more realistic and apply to most situations.

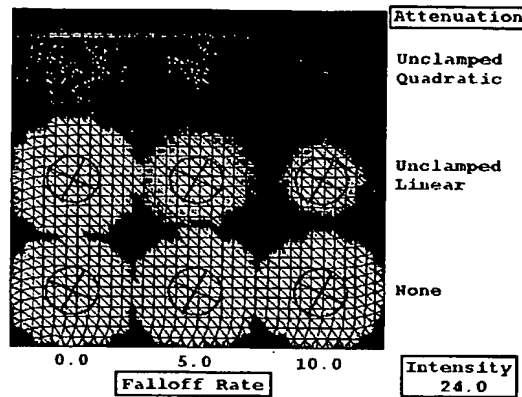
Cone Angle controls the maximum spread of the spot light. Objects that lay outside the area defined by the cone does not receive light. Objects that lay within the cone receives light according to the specified attenuation, falloff angle and falloff rate.



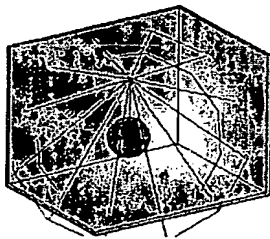
Falloff Angle controls the sharpness of the spot light's edge. The smaller the angle is the sharper the edge. The light intensity diminishes from full intensity at the inner cone to zero at the outer cone. The value for the falloff angle ranges from zero (0) degrees to $Cone Angle / 2$ degrees.

Falloff Rate controls how light is distributed within the spot light's cone. The intensity diminishes from the center line of the cone outward with the cosine of the angle raised to the power of the falloff rate. A falloff rate of zero (0) results in uniform light within the cone. Higher values produce more pronounced falloff. The falloff rate can be any value from zero (0) to ten (10).

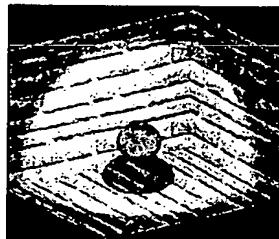
The graphic here shows the light attenuation and falloff rate for a spot light with an intensity of 24.



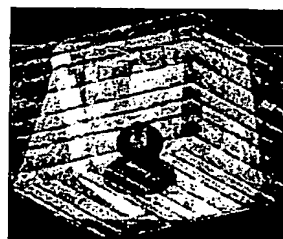
The Slide check box controls whether a spot light functions as a slide projector and projects an image on the scene. The example below shows the lighting scene with the spot light location and the lighting environment with and without the slide image.



The scene



Without slide image



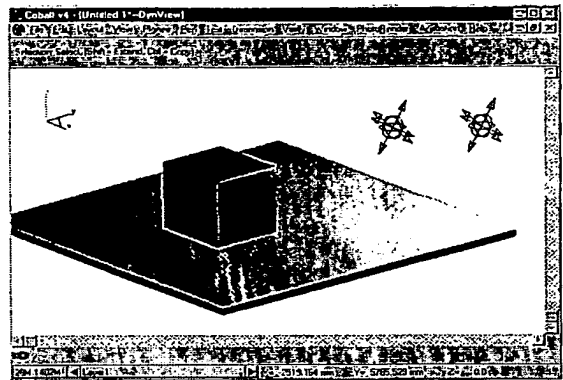
With slide image

The light source color is accessible through the Attributes page.

Point Light Source



A point light illuminates a scene with light emanating in all directions. A candle or a table lamp is a type of point light.



Using the Point Light Tool

1. Select the Point Light tool.
The Message Line reads: *Point Light: Enter location.*
2. Click to set the source location of the light.



Distance is only important if you want to specify an attenuation (see the Geometric Characteristics section for information on attenuation). The default setting does not include attenuation. A point light source symbol appears in your drawing with arrows pointing outward. If *Show Points* in the **Edit** menu is checked, the source location point displays.



Place more lights as desired. As you add lights, you may want to render the model again to verify the lighting effect.

Geometric Characteristics

According to the Edit Objects Geometry page, a point light source is made up of the following characteristics: Type, Intensity, Attenuation. It also includes the check boxes, Enable Light and Cast Shadows and its associated pull-down menu and the Cast Volumetric Shadows check box.

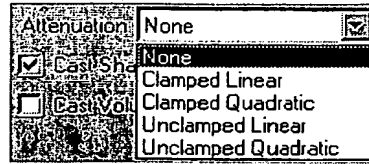
The Enable Light check box gives you the ability to turn off a light while retaining the intensity, direction and location settings.

The Cast Shadows check box controls whether a shadow is cast by an object when a particular light is directed towards it. When checked, shadows are cast. When unchecked, no shadows are cast as a result of that light. With its associated pull-down menu, you also have the option of setting the type of shadow casting. You have four shadow type options: hard, medium, soft and blurry. This check box set-

ting only applies when rendering your scene with Preview Render (shadows on) or Raytrace Render (shadows on, Anti-Alias). See the "Photorealistic Rendering Commands" section later in this chapter.

Attenuation Settings

Attenuation controls how quickly the light intensity diminishes with the distance from the light. You have the following attenuation options:



None	Light intensity does not change with distance.
Clamped Linear	Light intensity diminishes according to the following formula, $Intensity / (distance + 1)$.
Clamped Quadratic	Light intensity diminishes according to the following formula, $Intensity / (distance^2 + 1)$.
Unclamped Linear	Light intensity diminishes according to the following formula, $Intensity / distance$.
Unclamped Quadratic	Light intensity diminishes according to the following formula, $Intensity / distance^2$.

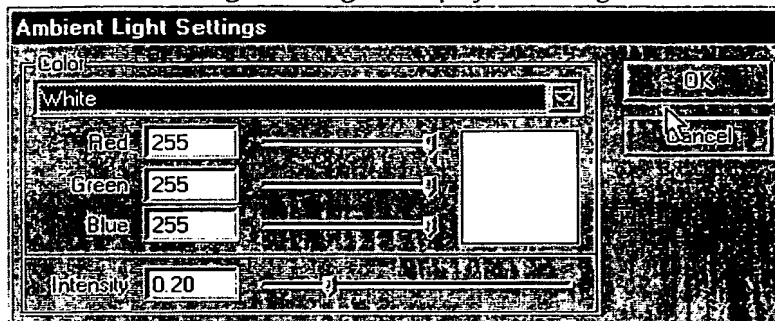
Use clamped attenuations for situations where the distance from a light source to an object is less than 1" (25.4 mm). Clamped attenuations do not increase intensity when the distance is less than 1" (25.4 mm). Unclamped situations are more realistic and apply to most situations.

The light source color is accessible through the Attributes page.

Ambient Lighting

Ambient light contributes light color and intensity to all objects in the scene. Ambient light penetrates all holes, indentations and cutouts of an object, illuminating all surfaces equally. Ambient light does not cast shadows.

Choose **View> Ambient Light Settings** to display the dialog box.



The dialog box contains the following options:

Color

This area sets the ambient light color. You can either choose a color from the menu, enter a Red, Green, or Blue value in the respective data field or drag the RGB slides to the desired value. A color preview appears to the right of the sliders. The default ambient light color is white.

Intensity

This option sets the ambient level. You can either enter the value in the data field or use the slide to set the intensity. Zero (0) is off.

After choosing your ambient settings, click OK. When you save your file, the ambient light setting is also saved.

Modifying the Lights

As you design your geometry and render it you may want to view it under various lighting conditions, either by changing the layout or editing the light source.

Modifying Ambient Light

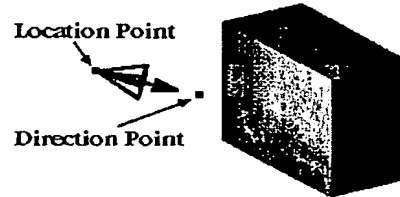
Ambient light can be modified through the Ambient Light Setting dialog box in the View menu. Adjust the color and intensity level and click OK to save the changes. Choose **PhotoRender>Render** to display your geometry with the new settings.

Modifying Directional Lights

You can modify directional lights (Distant, Spot and Point) in a number of ways including moving, deleting and changing the intensity and color.

Moving a Light Source

Light sources are objects and can be moved like any other object. The Distant and Spot light sources have two control points, the source location and the source direction. You can move one or both points. The Point light source has one control point, the source location.



Moving the Entire Light Source

Select the source. Place the cursor over the source location point and drag it to the new location. Choose **PhotoRender>Render** to display the image with the new light setting.

Moving the Control Points

Select the source and choose **Edit>Show Points** to display the control points. Drag a selection fence around the desired point and move it to the new location. Choose **PhotoRender>Render** to display the model with the new light setting.

Editing a Directional Light Source

You can perform comprehensive editing on directional light sources through the Edit Objects dialog box. The options available depend on the light source.

Geometry Tab

Type	You choose from the three lights available: Distant, Spot and Point.
Intensity	You can change the light intensity. Any value equal to or greater than zero is valid. Zero (0) turns the light source off.
Attenuation	(Spot and Point lights only) Controls how quickly the light intensity diminishes with the distance from the light.
Enable Light	This check box controls the activation of the light source. When checked, the light is on. This check box allows you to turn off a light while retaining the intensity, direction and location settings. The default setting is on.

Rendering

Cast Shadows	This check box controls the display of shadows when a light shines on an object. A pull-down menu offers four shadow types: hard, medium, soft and blurry. This command works with Preview Render (shadows on) and Raytrace Render (shadows on, Anti-Alias) rendering commands.
Cone Angle	(Spot light only) Controls the maximum spread of the spot light.
Falloff Angle	(Spot light only) Controls the sharpness of the spot light's edge.
Falloff Rate	(Spot light only) Controls how light is distributed within the spot light's cone.
Slide	(Spot light only) This check box controls whether a spot light functions as a slide projector and projects an image on the scene.
Attributes Tab	
Name	You can enter a specific name for the source.
Resolution	This characteristic does not apply to light sources.
Color	You can specify any color for your light source. The pull-down menu offers the standard colors and the <i>More</i> option, which displays the color palette when selected.
Control Pts	You can display or hide the control points of the light source.
Layer	You can place a light source on any layer. The menu displays all available layers.
Locked	You can locked the light source to prevent modification.

Click Apply to accept your changes and then Close to exit the dialog box. Choose **PhotoRender>Render** to display your geometry with the new light settings.

Deleting a Light Source

To delete a light source select the source and press the BACKSPACE key (Windows) or the DELETE key (Windows and Macintosh).

Default Lighting

This Designer Elements program provides default lighting for your geometry when you use the *Render* command. The default lighting is based on the viewer's eye location and direction to provide a high quality rendering of your geometry. The default light source cannot be modified. However, you can specify your own ambient light with the default lighting. When you place your own light sources, the default light source deactivates.

User-Defined Lighting Layouts

If you create your own lighting layout, you can use that layout for other drawings by exporting the lights to a stand-alone Designer Elements program file. This lighting file can then be imported into other files. To export a lighting set, do the following:

1. Select all the light sources by selecting each individually or using the Selection Mask.
2. Choose **File>Export**.
3. Select the Designer Elements program format.
4. Choose the Selected Only option.
5. Click OK and save the file as desired.

You can now import this lighting into other Designer Elements program files.

Basic Rendering

In this Designer Elements program you are able to design, display and edit your models in a wide range of visualization modes. These include the static and dynamic options, wireframe, Flat shading, Gouraud shading, Phong shading and Hidden Line modes (see the Render Options section for shading definitions). Basic rendering is implemented under Open GL available through your video card. You do not need to select the objects to render them.

Tech Note:

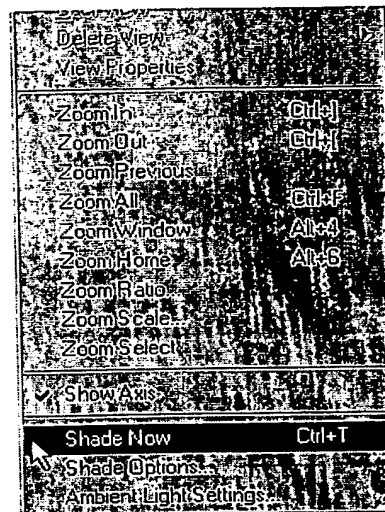
This Hidden Line mode is different from the hidden line images that appear in Drawing Views when using the *Model to Sheet* command. See Chapter 36 for more information.

Shade Now - CTRL+T (Windows); z +T (Macintosh)

This *Shade Now* command in the View menu, displays your geometry using the *Render Now* setting selected in the Render Options dialog box (see the next section).

To use this command, choose **View>Shade Now**.

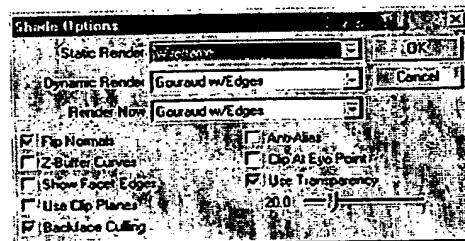
All surface and solid geometry in your drawing renders.



Shade Options

This Designer Elements program provides a number of options for rendering your geometry.

When you choose **View>Shade Options**, the following dialog box displays.



The dialog box includes the following rendering categories:

Static Render

This category defines how your geometry displays when the view is stationary. This Designer Elements program automatically repaints the object if this setting is changed and saved.

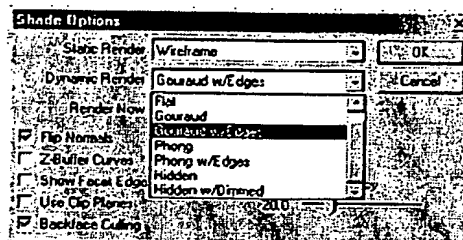
Dynamic Render

This category defines how your geometry displays as you rotate the view.

Render Now

This category defines how your geometry displays when you choose **View>Shade Now**.

When you click the arrow in a category a pull-down menu appears.



You have the following rendering options:

Wireframe

This option displays only the edges of the 3D model. This is the normal repaint display mode.



Flat

This option displays your geometry with a painter's algorithm using constant shading techniques.



Gouraud

This option displays your geometry based on calculated light intensities at each vertex. This rendering method uses Open GL (Windows) or Quick-Draw 3D (Macintosh).



Gouraud w/Edges

This option displays your model with face edge boundaries, silhouettes and isolines of a surface or solid on top of a rendered model. You can specify the edge color in the *Display* page of Preferences (see Chapter 6, "Preference Settings").



Phong

This option displays your geometry based on calculated light intensities at each pixel location.



Phong w/Edges

This option displays your model with face edge boundaries, silhouettes and isolines of a surface or solid on top of a rendered model. You can specify the edge color in the *Display* page of Preferences (see Chapter 6, "Preference Settings").



Tech Note:

If you set your Dynamic Render mode to Phong with Edges and notice that at time your model vanishes, that's the result of light reflection. Adjust your light levels or location and render again.

Rendering

Hidden

This option displays only the visible edges of your geometry. Since this is a rendering mode, any text present in wireframe does not display. Text and wireframe objects do not display in this mode.



Hidden w/Dimmed

This option displays the visible edges with the hidden edges of your geometry dimmed. Since this is a rendering mode, any text present in wireframe does not display. Text and wireframe objects do not display in this mode.



The dialog box also includes another render option setting:

Flip Normals

Placing a check mark in this box flips the light normal on objects. The Flip Normals box is checked by default. This Designer Elements program automatically repaints the object if this setting is changed and saved.

When you display a rendered object, its appearance is determined by the light locations and the object orientation. If light normals are pointed away from the viewer, the object will appear dark. This can happen when geometry is imported in from another program.

Flip Normal Example

If you import the following object and render it without the *Flip Normal* option checked parts of the object appear dark.



Check the *Flip Normal* option and render the object again. The normals pointing away from you are flipped and the darkened areas of the object render more acceptably.



You can also choose **Edit>Change Direction** to flip the direction of the normals.

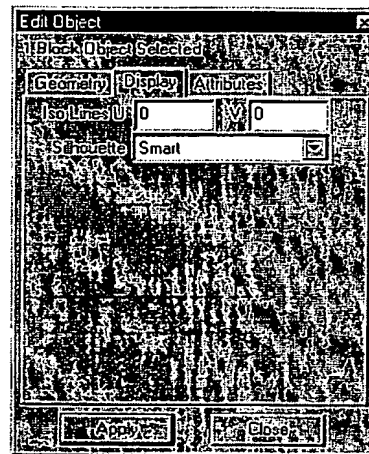
Setting the Shade Options

1. Choose **View>Shade Options**. The dialog box displays.
2. Select the render options you desire.
3. Click OK and the options are accepted. (Click Cancel to close the dialog box without saving the settings.)

If you changed the *Flip Normal* or the *Static Render* settings this Designer Elements program automatically repaints.

These settings save as the default settings when you exit the program.

If you've chosen Gouraud w/Edges or Phong w/Edges and you want to display your model with isolines or silhouette, double-click on your model to open the Edit Objects dialog box. In the *Display* page, specify your desired settings and click Apply.



Z-Buffer Curves

This option turns on or off OpenGL depth buffering of curves as they are displayed in context with surfaces and solids. With this option on, curves behind surfaces or solids are hidden and visible when turned off.

Show Facet Edges

The Show Facet Edges option turns on or off the edges of the display facets. The facet density is determined by the entity resolution.

Use Clip Planes

This option indicates whether to process clip planes for OpenGL rendering. When turned on, all planes entities that are marked as clip planes

Rendering

Backface Culling

will clip the current view. To mark a plane as a clip plane, right click over the entity and select the appropriate option in the menu.

Back face culling is an option that greatly enhances OpenGL performance. When this option on, OpenGL ignores all facets from solids that have normals facing away from the viewing direction. Turn this feature off if you have hybrid solids that mix open surfaces with solids, otherwise the surface may appear invisible in OpenGL display modes.

Anti-Alias

This option tells the OpenGL drivers to enable anti aliasing of edges.

Clip At Eye Point

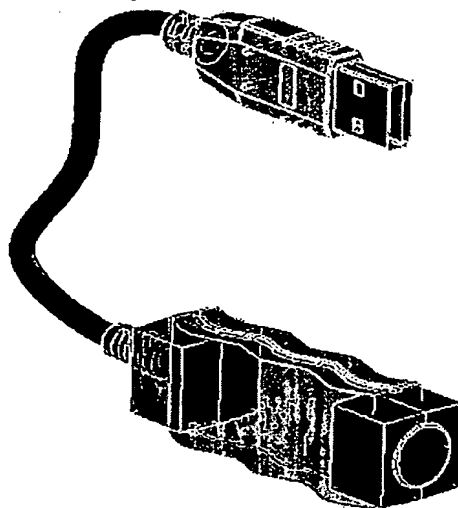
The clip at eye point turns on or off clipping at the eye point. If off, clipping is automatically determined based on the extents of the given model.

Use Transparency

This option indicates whether to process objects marked with a transparency flag for OpenGL transparency. When turned on all surface and solid entities that are marked as transparent will clip the current view. To mark an object as transparent, right click over the entity and select the transparent option from the menu.

The slider value indicates a global transparency setting. A setting of 100 implies no transparency and a value of 0 implies fully transparent. Below is

an example of an object containing transparent parts.



Render Option Combinations and View Rotation

Because the rendering options deal with the display of your geometry, the rendering categories operate with each other and are affected by the view.

Shade Options Example

1. Create some geometry.
2. In the Shade Options dialog box, set *Render Now* to Hidden w/Dimmed and *Static Render* to Wireframe.
3. Click OK to save the setting and close the dialog box.
4. Choose **View>Shade Now** and your geometry is displayed in Hidden w/Dimmed view mode.
5. Rotate the view. The geometry is now displayed as wireframe because of the *Static Render* setting.

Other Shade Combinations

Here are a few render combinations.

Rendering

Static Render - Wireframe, Dynamic Render - Gouraud

As you rotate the view your geometry displays with Gouraud shading. When you complete the rotation the geometry displays as a wireframe.

Static Render - Gouraud, Dynamic Render - Gouraud

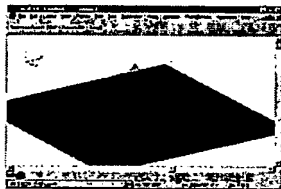
As you rotate the view your geometry displays with Gouraud shading. When you complete the rotation the geometry displays in Gouraud shading.

Render Options and Preferences

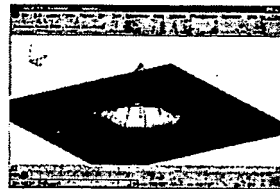
Render Options are saved automatically when you exit the program. They are written out to the preferences file.

Basic Rendering and Lighting

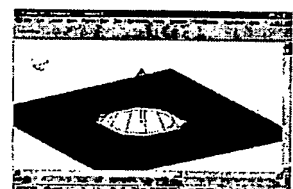
All facets are illuminated according to how much light falls on their vertices (the intersection of perpendicular isolines). If a light source is positioned over a large flat surface (such as a floor), it will appear that the source is not casting light. Set the object resolution to *Very Fine* or *Super Fine* to increase the facet density and enhance the lighting result. See Chapter 24 for more information on resolution.



Fine Resolution



Very Fine Resolution



Super Fine Resolution

Advanced Rendering

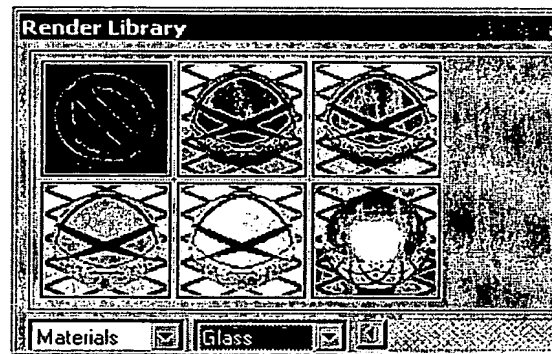
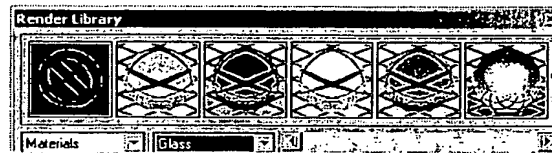
This Designer Elements program provides you with advanced rendering tools that control the definition and generation of photorealistic images. Unlike the basic rendering functionality, advanced rendering is not used during geometry construction and editing. Advanced rendering is a back-end tool that interacts with the geometry already created. Advanced rendering is implemented using the LightWorks rendering engine for both Windows and Macintosh.

The advanced rendering tools include the render library, advanced settings and rendering modes. You do not need to select objects to render them.

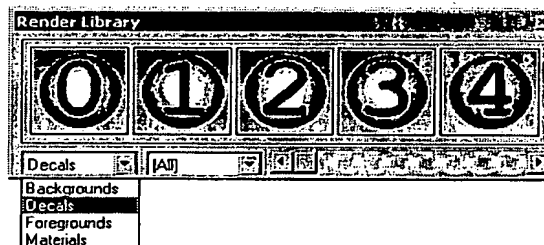
Render Library

This Designer Elements program comes with an extensive render library containing materials and decals that you can apply to objects and background and foreground properties that you can apply to the scene. This library is contained in the Render Library tool palette. Choose **Window>Render Library** to display the tool palette.

You can resize the palette horizontally or vertically by dragging its edges or corners.



The palette contains the preview area, library type menu, category menu and scroll bar. The type menu controls which library displays on the palette. The Decals library type is shown in the graphic here.



Render Library Items

The render library menu contains four render libraries: Backgrounds, Decals, Foregrounds and Materials. You can select any library by clicking on it or using the up or down arrow keys on your keyboard.

Backgrounds

Contains pre-defined background effects that can be applied to a scene.

Rendering

Decals

Contains pre-defined decals that can be applied to renderable objects.

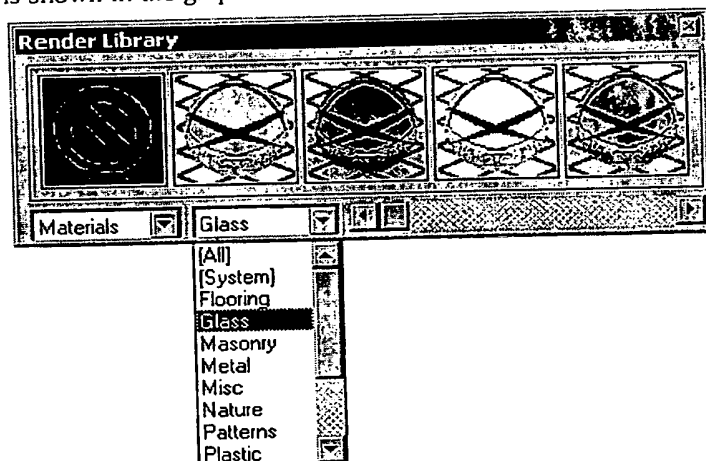
Foregrounds

Contains pre-defined foreground effects that can be applied to a scene.

Materials

Contains pre-defined material properties that can be applied to renderable objects.

Within each library render images are divided into categories and displayed in the category menu. You can select any category within the category menu by clicking on it or using the up or down arrow keys on your keyboard. The Glass category for Materials is shown in the graphic here.



In addition to the render image categories each library also includes two standard categories, [All] and [System].

[All]

Selecting this category displays every image in the chosen library.

[System]

Selecting this category displays images originally shipped with this Designer Elements program.

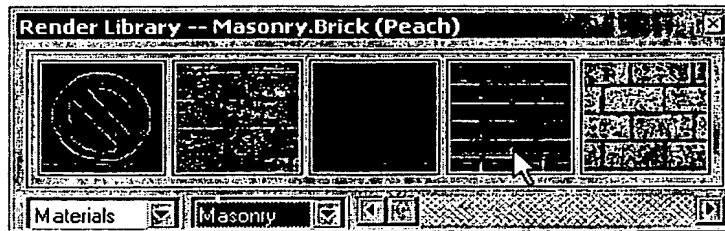
Most of the items in the Render Library define the color of your objects regardless of their pen color. However, to provide you with greater variety some materials use the object's color. These include the following: Glass (Colored), Masonry (Brick-

Colored), Metal (Polished), Misc. (Plain, Plain Rough, Plain Texture, Screen), Nature (Clouds), Patterns (Check Board, Cubes, Grid, Polka Dot Solid, Polka Dot Wrapped), Plastic (Clear Rough, Clear Texture, Opaque Rough, Opaque Texture, Stone (Marble), Wood (Simple) and Decals.

When you place one of these materials on an object, the material displays using the object's color. For example: Brick-colored masonry placed on a blue object renders as blue masonry; Clear Rough Plastic placed on the yellow object renders with a yellow tint; Clouds placed on a red object renders as white clouds on a red object; Polka Dots placed on a green object renders as green dots on a white object.

Using the Materials Library

The Materials library contains materials you can apply to your model. A material defines the surface color, transparency, reflectivity and roughness properties of a model. You can produce a wide variety of visual appearances with different combinations of these attributes.



The categories in the Materials library include Flooring, Glass, Masonry, Metal, Misc, Nature, Patterns, Plastic, Stone, Tiled Textures, Walls, Wood and Woven Textures.

Flooring

Render images include: Tile 1, Tile 2, Tile 3, Tile 4, Tile 5, Tile 6, Tile 7, Wood Slats 1 and Wood Slats 2.

Glass

Render images include: Clear, Colored and Mirror. The Clear and Colored options only display correctly when using one of the ray trace rendering commands.

Masonry

Render images include: Block Stone, Brick (Colored), Brick (White), Brick (Peach), Cobble Stone, English 1, English 2, Flemish, Pavement (Gray), Pavement (Red), Rustic, Stone Wall.

Rendering

Tech Note:

If you're using highly reflective material for an object in an empty space, the rendered image may disappear since there is nothing to reflect. Add some surrounding environment and render again.

Metal

Render images include: Aluminum, Aluminum (Circular Brushed), Aluminum (Linear Brushed), Chromium, Cobalt, Copper, Gold, Graphite, Mercury, Nickel, Palladium, Platinum, Polished, Silver and Tungsten.

Misc

Render images include: Bubble Wrap, Chisel, Plain Rough, Plain Texture and Screen.

Nature

Render images include: Clouds, Clover, Grass, Leather, Skin, Sky 1, Sky 2 and Sponge.

Patterns

Render images include: Checker Board, Cubes, Grid, Polka Dot Solid and Polka Dot Wrapped.

Plastic

Render images include: Clear Rough, Clear Texture, Opaque Rough, Opaque Texture and Translucent. The Clear Rough, Clear Texture and Translucent options only display correctly when using one of the ray trace rendering commands.

Stone

Render images include: Conglomeration, Granite, Gravel, Limestone, Marble, Marble (Gray), Marble (Pink), Sand and Silt.

Tiled Textures

Render images include: Knurl, Knurl 2, Mesh 1, Mesh 2, Pitted, Splatter, Swarf, VS Logo and Waffle.

Walls

Render images include: Diamond Paper, Tile 1, Tile 2, Tile 3, Tile 4 and Tile 5.

Wood

Render images include: Bark, Beech, Black Limb, Black Palm, Black Palm 2, Bocotec, Brazilian Ebony, Brazilian Rosewood, Bubingac, Canary, ChakteKok, Cocobola, Cork 1, Cork 2, CurlyKoac, Flamewood, Gabon Ebony, Goncalo Alvenc, Holly, Honduran Rosewood, Indonesian Rosewood, Kingwood, Lacewood, Lignum Vitae, Macassar Ebony, Madagascar Rosewood, Mahogany, Maple, Narrac, Pau Ferr, Pear, Pernambuco, Peroba Rosa 2, Pine, Pink Ivory, Primavera, Satinwood, Sawdust, Sheduac, Simple, Spalted, Tulipwood, Vera-wood, Walnut and Zebrawood.

Woven Textures

Render images include: Basket 1, Basket 2, Denim 1, Denim 2, Dog Tooth, Hessian, Loop and Webbing.

The graphic shown is an example of Cobble Stone masonry applied to a block.



Applying Materials

1. Choose **Window>Render Library** to display the dialog box.
2. Select the materials library and desired category in their respective menus.
3. Place the pointer over the desired render image and drag. As the image is dragged over the drawing, the pointer becomes the material application symbol.



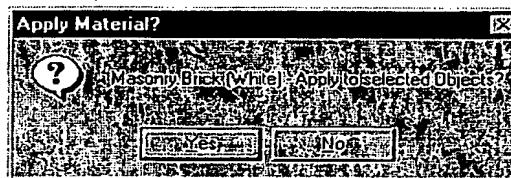
Application Sym-

4. Continue dragging to the object to which you want to apply the image. The object highlights. Release the mouse button.

You can apply a material to multiple objects simultaneously by selecting one or more objects while holding down the SHIFT key, position the cursor over the preview image (while still holding down the SHIFT key), then click the mouse button.

A dialog box appears asking you to confirm the operation.

5. Apply more images to your objects as desired. Then render your drawing using one of the commands in the Render menu.



Tip:

If you want to apply different materials to different faces of a solid, convert the faces to surfaces using the *Change Object Type* command and apply the materials to each individual surface.

Geometric Characteristics

When you apply materials to an object, a Material page is added to the Edit Objects dialog box. Each material potentially has a large set of characteristics determined by the internal material definition. These characteristics have been mapped to a basic set or common characteristics and include the following items: Reflectivity, Trans-

Rendering

parency, Roughness, Scale, Texture File, Enable Shadow Cast check box, Enable Shadow Receive check box, Double Side Facets check box and Is Backdrop Object check box. These characteristics are explained in the Material Editing section on page 38.

Removing or Replacing Material

To remove material from an object, drag the None symbol from the Render Library to the object and the material is removed. The symbol is shown here.

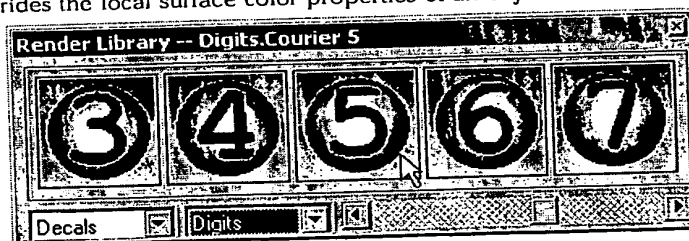


You can replace one material with another by simply dragging the new material image to the desired object. You can also replace a material by displaying the Edit Objects dialog box, selecting the Material page and from the Texture file pull-down menu, choose another texture.

See page 38 for more information about editing materials.

Using the Decals Library

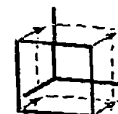
The Decals library contains pre-defined decals that you can apply to your model. A decal overrides the local surface color properties of an object to which it is applied.



When applied to an object, the decal snaps to its surface and adjusts its shape (planar rectangle, cylindrical patch or spherical patch) according to the selected surface. The decal shape is automatically determined by the surface curvature using one of this Designer Elements program internal wrap modes, Planar, Cylindrical or Spherical.

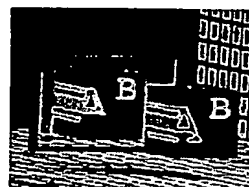
Planar Wrap

This mode projects artwork along the decal's normal vector and appears on the surface at the location you specify. The graphic shows a planar decal symbol. The gray arrows indicate the nor-



mal direction. The area defined by the artwork and the normals (the dotted lines) is the planar wedge.

The graphic shows planar wrapping for one object using two decals. One decal extends beyond the surface edge and wraps along the other adjacent surface as defined by the planar wedge. The object's reflection appears in the mirror behind it.



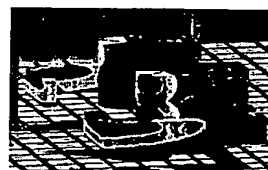
Cylindrical Wrap

This mode projects artwork along the surface normals of an imaginary cylinder that passes through the decal's location point. The decal molds itself to the selected object adjusting to the object's radius. The area defined by the artwork and the normals are the decal wedge area.

The graphic here shows a cylindrical decal symbol with the normal direction indicated by the arrows. Any portion of the object that lies within the area bounded by cylindrical wedge (the dotted area in the graphic) and its normal displays the artwork. If the decal extends past the object edge, the decal will drag towards the center of the object.



The graphic here shows cylindrical wrapping for one object composed of a cylinder, bracket and block. The decal extends beyond the edge of the



cylinder and bends toward the center of the cylindrical wedge, wrapping around the object. The object's reflection appears in the mirror behind it.

Spherical Wrap

This mode projects artwork along the surface normals of an imaginary sphere that passes through the decal's location point. The decal molds to the selected object adjusting to the object's radius. The graphic shows a spherical symbol with the normal direction indicated by the arrows. Any portion of the object that lies within the spherical wedge (the dotted area in the graphic) and its normal displays the artwork.



The graphic shows spherically wrapping for one object composed of a sphere and a bracket.



The categories in the Decals library include Misc and Digits.

Misc

Render images include: Eroded. When an object is rendered with this decal, the object material appears to be wearing away.

Digits

Render images include the numbers 0 through 9.

This graphic is another example of the decal wrap modes.



Applying Decals

1. Choose **Window>Render Library** to display the dialog box.
2. Select the desired library and category in their respective menus.
3. Place the pointer over the desired render image and drag. As the image is dragged over the drawing, the pointer becomes the decal symbol.

Tip:

To prevent a decal from showing through an object, select the decal and display the Edit Objects dialog box. Deselect the Auto Wrap option and select either the cylindrical or spherical wrap mode.



Decal Symbol

4. Continue dragging the decal to the object to which you want it applied. Use the axes included with the symbol for alignment. Release the mouse button.

Apply more decals to your objects as desired. Then render your drawing using one of the commands in the Render menu.

Removing or Replacing Decals

To remove a decal from an object select the decal and delete it like any other object. You can replace one decal with another using the Edit Object dialog box.

Geometric Characteristics

A decal is considered an object in this Designer Elements program. When you apply a decal, the Edit Objects dialog box contains characteristics specific to a decal object. The characteristics include: Rotation, Width, Height, Wrap Mode, Auto Wrap check box, Lock Normal check box, Masking, Stencil and Logo.

Rotation

This field sets the rotation angle of the decal. The default value is 0. Entering a new value (between 0 and 360) and clicking Apply rotates the decal around the decal normal by the specified angle.

Width/Height

These fields set the decal's coverage area. The values are linear or arc lengths depending on the wrap mode.

Wrap Mode

This field displays the decal wrap mode. It also includes a pull-down menu listing the three wrap modes, planar, cylindrical and spherical.

When Auto Wrap is not selected, use the wrap mode list to set the decal wrap mode. If the decal is moved to another object, the wrap mode does not change.

Auto Wrap

This check box allows you to control the wrap operation. When this box is checked, the wrap mode is matched to the surface curvature of the underlying object. The computed wrap mode is displayed in the Wrap Mode field. If the decal is moved to another face of the object, the wrap mode is re-calculated.

When this box is left unchecked, the wrap mode is set using the Wrap Mode pull-down menu.

Rendering

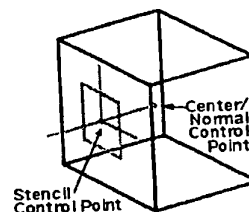
Lock Normal

One possible application of this is when you want to apply a decal to a fillet. Uncheck auto wrap and lock normal and place the decal over the fillet.

This check box locks the normal of the decal. When this box is checked, the decal's normal is always perpendicular to the object at the selected surface. When left unchecked, the decal can be placed at any angle with respect to the surface.

By selecting the decal and choosing **Edit>Show Points**, two control points display, the stencil control point and the normal point.

Select the stencil control point and drag it to a new angle. If you select Lock Normal again and click Apply, the decal snaps back to the normal location.



Radius

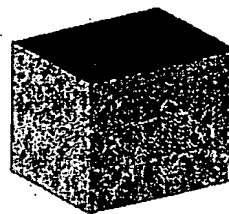
(Cylindrical and Spherical wrap only) Specify a radius for the center point or the stencil control of the decal, different from the default value listed.

When placing a decal on a face it automatically projects through to the back face. Changing this value such that the radius falls within the body results in the decal appearing only on the face to which it was applied.

Masking

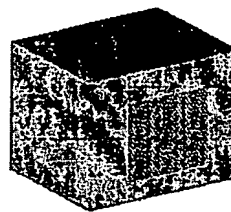
This menu controls how a decal is applied on an object's surface. You have two options, *Stencil* and *Factor*.

Stencil masking uses an image file to define the regions of the decal artwork that will show on an object's surface. The graphic here uses a star stencil and mesh artwork.



Factor masking is used to put a full image on an object surface. Where stencil masking only places artwork on the object as defined by the stencil, factor masking places the entire artwork image on the object with no cropping. This can be used for placing logos on objects or artwork on walls.

The graphic here shows the same artwork with factor masking instead of stencil masking.



Stencil

(Appears when Stencil Masking is selected) This field displays the name of the image file used. These stencil files are located in the Textures folder within the PhotoRender folder. If you want to use your own stencils in this Designer Elements program, place them in this folder.

When creating your own stencils it is important to know that a stencil is composed of pixels using the RGB color system. The red component (per RGB) of each pixel in the stencil image file is used as the color mix factor. A red value of 0.0 indicates that 0% of the artwork color is used at the pixel location. Thus, that pixel color is determined by the color of the object's material. A red value of 1.0 indicates that 100% of the artwork color is used at

Rendering

the pixel location in place of the color of the object's material. An intermediate value results in a mixture of the artwork color and the underlying material color.

Example: If you create a stencil that is 100% red (RGB), only the artwork color projected onto the object is used. If you lower the red percentage, some of the underlying material color mixes in. If you use black and red in your stencil, those areas that are black (or a 0% red value) use the underlying material color when the artwork is projected. Any color other than black or red in the stencil is ignored.

Typically, a stencil file is composed of fully red and fully black pixels. This provides a clean cropping of decal artwork. However, aged effects can be created using a stencil image file that consists of a mottled red patch on a black background.

In equation form, this combination translates into:
$$\text{SurfaceColor} = \text{ArtWorkColor} * \text{RedVal} + \text{MaterialColor} * (1.0 - \text{RedVal})$$

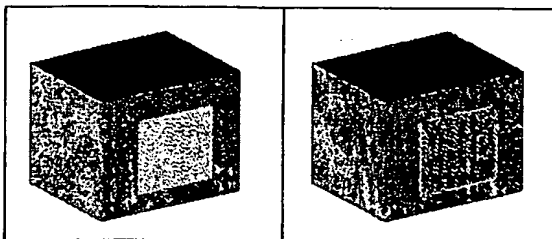
This formula shows how this Designer Elements program references the stencil file.

Factor slide

(Appears when Factor Masking is selected) This slide allows you to set the value for Factor masking. Factor masking uses a single mix factor to compute the artwork material color combination. This masking is similar to Stencil masking except that there is only one value used for all pixels.

When the slider is set to the far left, representing 0.0, the decal color is set by the object's material. When the slider is set to the far right, representing 1.0, the decal color is used. The left graphic below

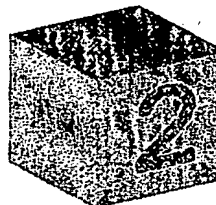
has a 0.0 factor setting. The right graphic has a 1.0 factor setting.



In equation form the combination translates into:
 $Surface = ArtWorkColor * MixFactor + MaterialColor * (1.0 - MixFactor)$

Logo

This menu sets the source for the decal's artwork. You have two options, Color and Image. In the example here, the DigitCourier2 is used as the decal stencil and a pebble image is used as the artwork.



Color logos use a solid color for the decal artwork. By default the color of the decal stencil is used when placed on an object. You can change the color of the decal by selecting it and choosing a different color in the Pen menu or on the Attributes page of the Edit Object dialog box.

Image logos use an image file for the decal artwork.

Image

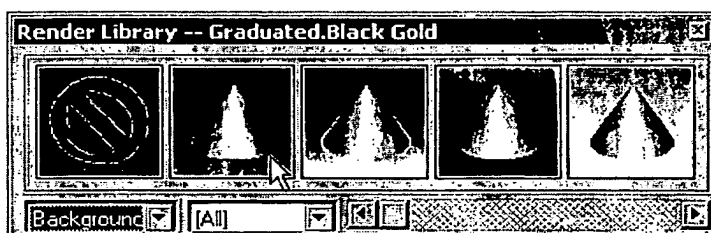
(Appears when Image is selected from the Logo menu.) This pull-down menu lists the images available for decal artwork. These images are located in the Textures folder within the Photo Render folder. If you want to use your own images place them in this folder. See page 36 for more information.

Using the Backgrounds and Foregrounds Libraries

Backgrounds and foregrounds can be used to set the overall scene. You can only use one foreground and one background per rendered drawing.

Backgrounds Library

The Backgrounds library contains pre-defined background effects you can apply to your model. Backgrounds control the appearance of those regions of a scene that do not contain objects.



The categories in the Backgrounds library include Images, Misc and Nature.

Images

Render images include: VS Logo.

Misc

Render images include: Graduated (Gray Black, Purple White, Red White, White Black, White Gray, White Purple, White Red) and Plain (Black, Gray, White).

Nature

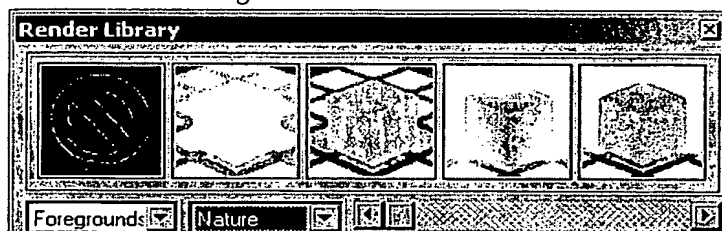
Render images include: Clouds.

The graphic shown is an example of a cloud background.



Foregrounds Library

The Foregrounds library contains pre-defined foreground effects you can apply to your model. Foregrounds effect the way the space between the eye point and the scene objects alter the rendering results.



The categories in the Foregrounds library include Misc and Nature.

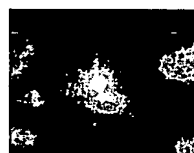
Misc

Render images include: Depth Cue (Black, Gray and White).

Nature

Render images include: Fog (Heavy, Light), Ground Fog (Deep, Shallow) and Snow (Light, Heavy).

The graphic shown is an example of a snow foreground.



Applying a Background or Foreground

1. Choose **Window>Render Library** to display the dialog box.
2. Select the desired foreground or background library.
3. Place the pointer over the desired render image and drag. As the image is dragged over the drawing, the pointer becomes the application symbol.
4. Drag to the drawing area and release the mouse button.

Removing or Replacing Backgrounds and Foregrounds

To remove a background or foreground from a scene drag the None symbol from the Render Library to the object and the material is removed. The No Material symbol is shown here.



You can replace one background or foreground with another by dragging the new image to the scene.

Geometric Characteristics

Foregrounds and Backgrounds have no geometric characteristics therefore are not accessible through the Edit Objects dialog box. However, they can be edited using the Edit Foreground or Edit Background commands in the Render menu. For information, see "Background and Foreground Editing" on page 47.

User-defined Images

You can use your own material and decal images in this Designer Elements program when used with the Edit Objects dialog box. This ability is useful if you have specific materials or decals unique to your company and industry. One possible use is the application of company logos to objects in your drawing.

To prevent distortion all texture images should be square. LightWorks, the rendering engine, maps textures to a 1" square when the scale is set to 1.0.

Creating your own Decals

If you want to apply your own decals you need create your own decal stencils and artwork. Since the artwork projects through the stencil, any bitmap image is acceptable. Create your artwork image using any graphic program that supports bitmaps.

To create a stencil do the following:

1. Create the shape of your stencil.
2. Color your stencil using a percentage of red depending on the desired stencil affect.

Set the Red value (RGB color) to 255 or 100% red if you only want to project the artwork color onto the object without using the material's color. Lower the Red value to mix some of the underlying material's color with the artwork color. Use black in those areas where you only want to use the material's color when the artwork is projected.

Applying User-defined Material Images

1. Create your own bitmaps images.
2. Place them in the Textures folder located within the PhotoRender folder stored with the program.

These textures will not appear as an image in the Render Library.

3. Apply a Designer Elements program supplied texture to your object.
4. Double-click on the object to display the Edit Objects dialog box.

5. From the Texture file menu select the image you created.
6. Click Apply and render your scene.

Your own material is displayed on your object.

Applying User-defined Decal Images

1. Create your own bitmap images, both the decal stencil and the decal artwork.
Make sure you follow the stencil and artwork formulas as directed earlier in this chapter.
2. Place the stencils and image in the Textures folder located within the PhotoRender folder stored with the program.
3. Double-click on the decal to display the Edit Objects dialog box.
4. From the Stencil menu in Edit Objects select the stencil image you created.
5. In the Logo menu choose the Image option.
6. From the Image menu, select the artwork image you created.
7. Click Apply and render your scene.

Your own decal is displayed in your scene.

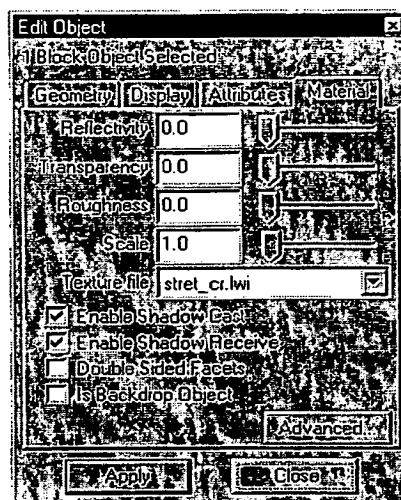
Editing the Rendered Scene

This Designer Elements program now gives you access to Lightworks shader technology. Instead of one shader, you now have five different shaders to render your scene. You can change your object materials or the background and foreground images.

Once you have applied materials to your objects and applied a background or foreground if desired, you can edit them.

Material Editing

There are two levels of editing materials of an object; the first is through the Material page in the Edit Objects dialog box; the second is through the Render Material Settings dialog box accessed through the Material page.



The Material page of the Edit Objects dialog box include the following characteristics or options:

Tip:

When using materials such as polished metal setting the reflectivity to a value less than one may produce a better rendering.

Reflectivity

This field sets the material's reflectivity. Values can be entered between zero (0) and one (1). Entering a zero in the field renders a flat finish. Entering a one in the field renders a mirrored finish.

Transparency

This field sets the transparency of the material. Values can be entered between zero (0=transparent) and one (1=opaque). This option only works correctly when objects are rendered with ray trace rendering commands.

Roughness

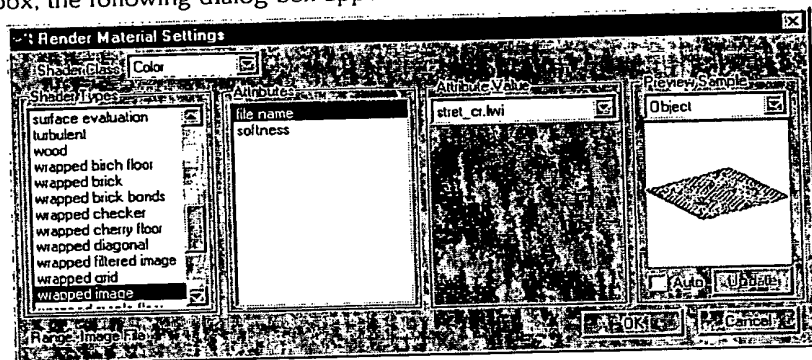
This field sets the roughness of the material. Values can be entered between zero (0) and one (1).

Scale	This field sets the scale of the of the material. Typically scale increases the size of the detail. Values can be entered equal to or greater than zero (0).
Texture File	This field displays the selected material. The pull-down menu lists all images in the texture folder. For those materials that do not support textures this menu is not available.
Enable Shadow Cast	This check box allows you to specify if an object casts shadows. This is valuable for reducing the shadows present in complex drawings. When checked the selected object casts shadows.
Enable Shadow Receive	This check box allows you to specify whether an object will receive shadows from other objects. This ability is valuable for reducing the number of shadows present in complex drawings. When checked the selected object receives shadows.
Double Sided Facets	<p>This check box provides you with additional rendering control for surfaces. Objects with normals facing away from the line of sight are not rendered. When checked all objects are rendered, regardless of the normal direction.</p> <p>Select this option for objects that cause light refraction, like glass. When left unchecked facets on the back side of the glass are ignored resulting in an inaccurate rendering.</p>
Is Backdrop Object	<p>This check box allows you to optimize rendering calculation time for an object, like a wall, that functions only as a backdrop for other objects. Since the object automatically receives light due to its large size, this Designer Elements program does not need to spend much time performing light ray calculations.</p>
Advanced button	Clicking this button brings up the Render Material Settings dialog box. Use this dialog to change the advanced rendering settings used on the selected

object. See the next section for a detail description of these settings.

Render Material Settings

When you click the Advanced button on the Material page of the Edit Objects dialog box, the following dialog box appears.



The dialog box includes the following sections and options:

Shader Class

This section displays the shader class. Select the class from the pull-down menu. You have five shader classes: Color, Displacement, Reflectance, Transparency and Texture Space. The shader types, their associated attributes and values vary with the shader class. Each shader class works independently of the others. The setting for one shader does not affect another. However, the settings in each class work together to create the final object appearance when it's rendered.

Shader Types

This section lists the shader types for the selected class. Select the type from the list. Each set of types is unique to the class. Each type has its own set of attributes.

Attributes

This section displays the attributes for the selected type. Select an attribute for the type from those listed. Each attribute has its own set of values.

Attribute Value

This section usually displays the values for the selected attribute. Choose or enter the attribute value. The value range appears at the lower left corner of the dialog box. The values can be numerical, an image file or a color setting. An Edit button displays in this section when a shader attribute is selected. Clicking this button displays a copy the dialog box allowing you to select the shader from the same shader type list as the original dialog box.

Preview Sample

This section displays the *preview window* shape list, *preview window*, the *Auto* option and an Update button.

The *preview window* shape list allows you to set the object shape shown in the window. There are five shapes available from the pull-down menu: cone, cube, cylinder, object and sphere. This feature allows you to see how the same shading characteristics appear on different shapes. Object, which displays the actual shape, is the default shape.

The *preview window* displays the shape based on the shader class, type, attributes and values currently set.

The *Auto* option controls whether the preview image is automatically refreshed when a material setting changes. Checking this box results in an automatic refresh. When checked, the Update button is unavailable.

The Update button controls the manual refresh of the preview window. Click the button to refresh the preview window image after making a material setting change.

Range

This area, at the lower left edge of the dialog box, displays the value range for the selected attribute.

Rendering

OK

Click this button to close the dialog box and save the settings. The selected object automatically updates to reflect the changes.

Cancel

Click this button to close the dialog box without saving the changes.

After you specify the settings for an object from the desired classes and types, this Designer Elements program combines the settings from all five shaders (Color, Displacement, Reflectance, Transparency, Texture Space) to render the object with one of the photorealistic commands. The settings work together to create the final effect.

Tech Note:

If you enter values in the attribute value field and change to another shade type, those values are not retained. If you want to experiment with various settings, record the values before changing shader types.

Color Class

Use this class to define the object color. The color shader types allow you to specify a color from one color to more complex patterns of color. The shader types are listed alphabetically. For the purposes of this explanation, the types are grouped into following categories:

Curvature

These types use color to show the object's curvature and include: absolute, gaussian, geometric and mean.

Texture

These types are 3D color shaders that give the object a specific appearance. The texture shaders include: birch, blue marble, cherry, chrome, maple, marble, oak, pine, plain, simple wood, solid clouds, solid polka and wood.

These shaders are different from image shaders in that they calculate a particular pixel color in 3D space for the object based on the type attributes. Imagine the object carved out of a block of the selected texture. In contrast, an image shader uses the associated 2D bitmap to determine the object color rather than individual pixels.

Evaluation

These types use color to evaluate the selected object and include: draft angle and surface. See the Verify Menu section of Chapter 24 for information of surface and draft evaluation. You can also see

Chapter 21 for surface evaluation and Chapter 23 for draft evaluation.

Wrapped Image

These types use an associated 2D bitmap image to determine the object color. The image is wrapped around and mapped to the entire object. These types include: wrapped image and wrapped filtered image. The available images are located in the Textures folder inside the PhotoRender folder.

Wrapped Textures

These types are 2D color shaders that are wrapped around the object. Unlike wrapped image shaders, these shaders calculate the shader color based on the attribute values and are not associated with a bitmap image. These shaders include: birch floor, wrapped brick, wrapped checker, wrapped cherry floor, wrapped diagonal, wrapped grid, wrapped maple floor, wrapped oak floor, wrapped pine floor, wrapped polka, wrapped s stripe, wrapped t stripe, wrapped textured brick and wrapped wood floor.

Decal

The decal shader type allows you to define the decal texture space, transparency and color.

Turbulent

The turbulent shader type creates an agitated or turbulent effect using color and contrast.

All shader attributes are defined in Appendix G.

Displacement Class

Use this class to define the roughness of an object. The displacement shader types allow you specify a variety of roughness patterns. The shader types are listed alphabetically. For the purposes of this explanation, the types are grouped into following categories:

Displacement

These types create a displacement calculated in 3D space using the pattern defined by the shader's attributes and include: casting, flat, leather and rough. Like the Color texture shaders, imagine that the object is carved out of a displacement shader block.

Rendering

Wrapped Displacement

These types create a displacement by wrapping the 2D pattern defined by the type attributes around the object. The shaders include: wrapped dimple, wrapped knurl, wrapped leather, wrapped rough and wrapped tread plate.

Wrapped Image

These types use an associated 2D bitmap image to determine the displacement and include: wrapped bump map and wrapped old bump map. When using an image for displacement, the shader examines the % color change from pixel to pixel to determine the displacement. For example, an image with black and white stripes might appear as a groove displacement. Gradual color changes in an image result in a more general displacement from pixel to pixel. The available images are located in the Textures folder inside the PhotoRender folder.

None

This type creates no displacement.

All shader attributes are defined in Appendix G.

Reflectance Class

Use this class to define the object's reflectance. The reflectance shader types allow you specify a variety of reflectance values and patterns defining a surface's finish. If no reflectance is specified for a material, the default Gouraud type finish is applied.

The shader types are listed alphabetically. For the purposes of this explanation, the types are grouped into following categories:

Standard

These types are reflectance modelers that provide a particular appearance according to the shader selected. These shaders include: chrome 2D, constant (color), matte finish, metal finish, multilayer paint, phong, plastic, translucency and translucent plastic.

Ray Trace

These type modelers are reflectance simulations using ray tracing. They range in accuracy from approximations to physically accurate. These shad-

Tech Note:

Remember that by definition applying a reflectance to an object means that the object will have something to reflect. If there is no background on other object in the scene to reflect, when rendered the object may disappear.

	ers include: conductor (metallic), dielectric (glass), glass (approximation) and mirror.
Wrapped	These type reflectance shaders wrap the reflectance image around the object creating the effect specified by the shader. These shaders include: wrapped anisotropic (parallel ridges), wrapped circular anisotropic (circular ridges), wrapped mirror map and wrapped woven anisotropic (woven threads).
Decal	This reflectance shader allows you to define the decal and base color reflectance.

All shader attributes are defined in Appendix G.

Transparency Class

Use this class to define the transparency of the object. This shader types allow you to set transparent or opaque nature of an object. These shaders can create transparency effects which range from simple to complex and irregular. The shader types are listed alphabetically. For the purposes of this explanation, the types are grouped into following categories:

Standard	These types create a transparent effect based on the shader selected and include: eroded, glow, plain (based on the red component of the color selected where red is transparent and black is opaque) and plain coverage (based on a value).
Wrapped	These types create a transparent effect by wrapping the effect around the object and include: wrapped checker, wrapped grid, wrapped mask and wrapped square.
Wrapped Image	These types create a transparent effect by wrapping a 2D image around the object and include: wrapped image and wrapped mask. The available images are located in the Textures folder inside the PhotoRender folder.
None	This type creates no transparent effect.

All shader attributes are defined in Appendix G.

Texture Space Class

Use this class to define the plane of the texture space or how textures are projected to the object. If no texture space is selected, the texture is projected down the z axis and uses the z plane. The types include the following:

arbitrary plane	This type allows you to specify the vector along which the texture is projected.
auto axis	This type automatically chooses either the x, y or z axis, depending on the normal of the object face.
cylindrical	This type projects the texture image to a cylindrical space using the user-defined origin to set the texture's starting point.
spherical	This type projects the texture image to a spherical space around the radials.
uv	This type projects the texture onto the object using the uv coordinate system.
x plane	This type projects the texture to a constant x plane where the positive z axis is up.
y plane	This type projects the texture to a constant y plane where the positive z axis is up.
z plane	This type projects the texture to a constant z plane where the positive y axis is up.

All shader attributes are defined in Appendix G.

Using the Render Material Settings Dialog Box to Edit Your Object

1. Double click on the object you want to modify to open the Edit Objects dialog box.

Remember that a material must already have been applied to the object.

2. Select the Material page.
3. Click the Advanced button to display the Render Material Settings dialog box.
4. Select the desired settings for each shader class, as desired.
5. Preview your object using the Update button or the *Auto* option.

6. Click OK when you are satisfied with the settings to close the dialog box and save the settings.

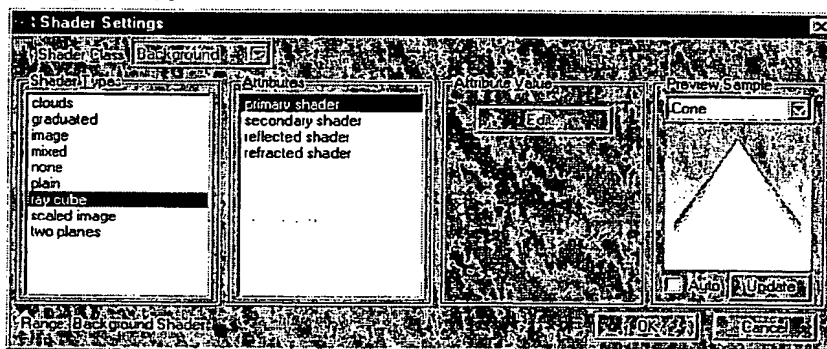
You can now select another object to edit or use the **Eye Dropper** tool to apply the same setting from this object to another object. The **Eye Dropper** tool copies object characteristics such as line font, color, pattern, arrow at start and end and render materials from one object to another. See the Chapter 4 for information on the **Eye Dropper** tool.

7. Render your scene with one of the photorealistic commands. Your objects now appear based on the settings you specified for each object.

See page 52 for information on using the photorealistic commands.

Background and Foreground Editing

To edit the background or foreground appearance already applied to your scene, choose **PhotoRender>Edit Background** or **Foreground**. (If you did not apply a background or foreground to your scene, no dialog box appears.) The Shader Settings dialog box appears.



This dialog box is almost identical to the one that appears when editing object materials and is divided into the same sections, Shader Class, Shader Types, Attributes, Attribute Value and Preview Sample. See page 40 for a description of each section.

For certain shader types the Attribute value is the Edit button. Clicking the button opens another Shader Settings dialog box that is identical to the first. Select the shader type, attributes and attribute values and click OK. You are returned to the first Shader Settings dialog box.

Background Settings

The Shader Settings dialog box contains only the Background class and its related types, attributes and values. The shader types are listed alphabetically and include:

clouds	This shader type creates a cloudy background.
graduated	This shader type displays a graduated background in the color you specify.
image	This shader type applies a background from an image file. The available images are located in the Textures folder inside the PhotoRender folder.
mixed	This shader type allows you to mix background shaders according to the mixing ratio. Ratios between 0 and .5 favor the base shader. Clicking on the Edit button in the Attribute Value section opens a second Shader Settings dialog box for choosing the shader.
none	No background appears in your scene.
plain	This shader type displays one color background.
ray cube	This shader type displays a background using primary and secondary shaders to deal with refractions and reflections. One shader is used for background areas that are directly visible. The other shader is used for the refraction component. For example, if this Designer Elements program casts a ray that does not intersect any geometry, the primary shader is used. If the ray does intersect geometry the ray is reflected and uses the secondary shader.
scaled image	This shader type applies the background from an image file which is scaled to fill the drawing window. The available images are located in the Textures folder inside the PhotoRender folder.
two planes	This shader type applies a background using a back and front shader to deal with refractions and reflections. One shader is used for background

areas that are directly visible. The other shader is used for the refraction component. For example, if you have a mirrored object and set the front shader to one type and the back shader to another, the shaders are reflected on the object.

Foreground Settings

The Shader Settings dialog box contains only the Foreground class and its related types, attributes and values. The shader types are listed alphabetically and include:

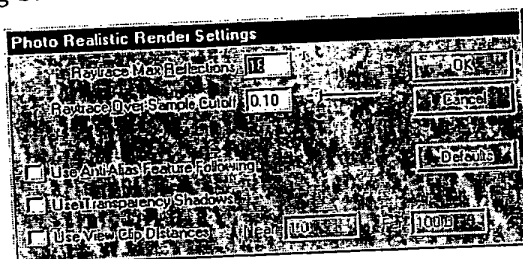
depth cue	This shader applies a background color with a linear attenuation of the color between a specified near and far value.
fog	The shader applies a gradual fog to the scene based on the color, density and distance specified by the user.
fog light	This shader creates a light scattering effect when used with point and spot light sources.
ground fog	This shader simulates fog that decreases gradually with altitude.
light scattering	This shader creates an atmospheric scattering of light effect more general than that created by the fog light shader.
none	No foreground appears in your scene.
scattering medium	This shader simulates a dense scattering medium based on various settings including color, shadows, attenuation and density.
snow	This shader simulates the effect of falling snow.

Photorealistic Rendering

This Designer Elements program gives you the ability to photorealistically render your geometry. You can specify rendering settings and choose among various commands before rendering your scene.

Photorealistic Rendering Settings

You can change the low-level behavior of the rendering engine through the Photo Realistic Render Settings dialog box. Choose **PhotoRender>Advanced Settings** to display the dialog box.



The dialog box contains the following options:

Raytrace Max Reflections

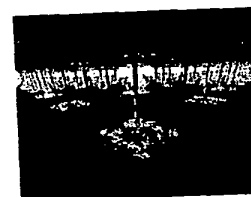
This setting controls the maximum number of bounces a ray travels. Once a ray has reached the specified limit no further color calculations occur for that ray. The images of a mirror-walled room, shown here, demonstrate the effect of changes in the value.



Max Reflections = 2



Max Reflections = 6



Max Reflections = 16

Raytrace Over-Sample Cutoff

This setting controls the threshold for adaptive image over-sampling. When the rendering operation encounters a significant color change in your image, it will be sampled until the largest of the red, green and blue components for the adjacent color samples do not differ by more than the specified value. The value can be between 0.0 and 1.0.

Use Anti-Alias Feature Following

Enter a value or use the slider to set the sampling limit. The default value is 0.1.

This check box controls the application of Feature Following. When checked, a second pass is made over an image bringing out small geometric feature details that may have been lost due to ray sampling aliasing.

Use Transparency Shadows

This check box controls the behavior of shadow generation for transparent objects. When checked, the transparent object casts a shadow as determined by its shape and color. When left unchecked, the transparent object casts an opaque shadow.

One example of this is a stained glass window. When checked, the window projects color shadows. Left unchecked, the window projects an opaque shadow.



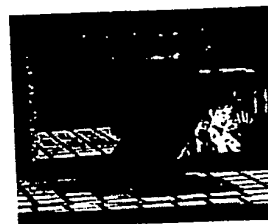
Use View Clip Distances

This check box controls the near and far clipping plane behavior. Near and far planes are normal to the view vector and are at a specified distance from the eye point (see Chapter 30 for information on eye points). Any objects or portions of objects that lie before the near clipping plane and after the far clipping plane are ignored. As implied, an object can be sliced if intersected by a clipping plane.

When checked, the Near and Far data fields become available. Enter the Near and Far distances. The units are based on those set in *Units* page of Preferences.

Rendering

The graphic here shows an example of a clipped image.



When left unchecked, clipping planes are automatically set to the near and far view extents of the model and the objects in view are rendered. This box is left unchecked by default.

OK

Click this button to save the new settings and close the dialog box.

Cancel

Click this button to exit the dialog box without saving the settings.

Defaults

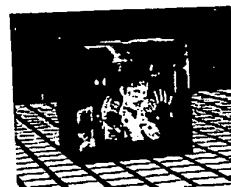
Click this button to return the settings to the factory state.

Photorealistic Rendering Commands

There are four render to window commands in this Designer Elements program: *Preview Render (shadows off)*, *Preview Render (shadows on)*, *Raytrace Render (shadows off)* and *Raytrace Render (shadows on, Anti-Alias)*.

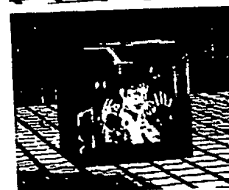
**Preview Render
(shadows off)**

This command creates a quality rendering of your scene. It renders most rapidly of all the commands since there are no ray tracing and shadow calculations.



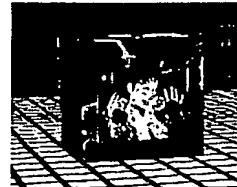
**Preview Render
(shadows on)**

This command creates a more realistic rendering than Preview Render (shadows off) with shadows. It renders quickly since there is no ray tracing.



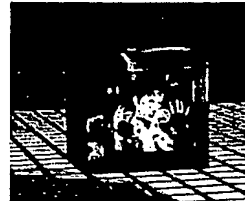
**Raytrace Render
(shadows off)**

This command creates a high quality rendering of your scene. The processing time is extended with addition of the ray tracing operation.



**Raytrace Render
(shadows on, Anti-Alias)**

This command creates the highest quality rendering of your scene, eliminating jagged edges. It uses the accuracy of ray tracing with anti-alias over-sampling. The computational time is significantly longer. The Advanced Setting dialog box controls the sampling calculations.



When using a rendering command any objects with no specified material have a default material/shader applied to them the first time the scene is rendered. The default shader settings are as follows: Color shader - plain, Reflectance shader - Phong, Transparency shader - none and Displacement shader - none.

The *DefaultVSMFile* entry in the *[RenderOptions]* section of the *Render.ini* file controls the default material. If the *DefaultVSMFile* entry is not found, the material specified by the *MiscPlain* material is used.

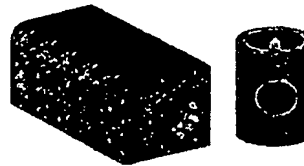
For more information on shader types, see the "Render Material Settings" section on page 40.

Rendering your Geometry

This Designer Elements program allows you to render your entire scene or a specified area.

Rendering your Entire Scene

This Designer Elements program enables you to render your entire scene with one command, showing you how the applied materials appear on your objects. The graphic is rendered using the *Raytrace Render (shadows on, Anti-Alias)*.



1. Apply materials to the objects in your scene.

Rendering

2. Choose **PhotoRender>** and the command.

Your scene renders.

Rendering an Area

When applying materials to your objects, you may want to see the results from one specific area of your scene. The area render feature gives you that ability. Using the CTRL (Windows) or OPTION (Macintosh) key, you can specify an area to render. In the graphic only the area around the left object is rendered.



1. Apply materials to objects in your scene.
2. Hold down the CTRL (Windows) or OPTION (Macintosh) key and from the PhotoRender menu, select one of the photorealistic commands.

The Message Line reads: *Advanced Render: Box area to render.*

3. While still holding down the CTRL (Windows) or OPTION (Macintosh) key, drag a selection fence to define the rendering area.
4. Release the CTRL (Windows) or OPTION (Macintosh) key and the mouse button.

The area renders.

Render to File

In addition to the commands for rendering your scene to a window, you can render your image to a file. Choose **PhotoRender>Render to File** to display the dialog box.

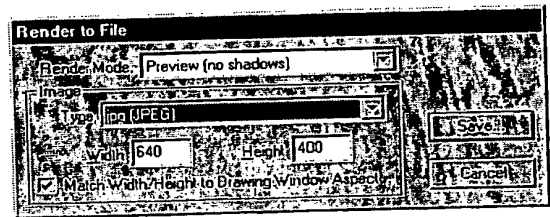
The dialog box contains the following options:

Render Mode

The pull-down list allows you to specify the render mode used in creating the file.

Image Type

This section provides you with output file types. These include eight image format types: Windows bitmap (bmp), Targa (tga), TIFF (tif), JPEG (jpg),



Tech Note:

This Designer Elements program does not support directly printing a photorealistic image. Use the Render to File command on your image, open the file in a graphics application and print from there.

Image Width/Height

Lightworks (lwi) and Encapsulated Postscript (eps).

These data fields allow you to specify the image size in pixels. If you want a six inch wide image with 300 dpi, enter 6"*300 in the Width data field.

These fields function with the Match Width/Height to Drawing Window Aspect check box.

Match Width/Height to (Drawing Window Aspect)

When checked, the image's width to height ratio equals the drawing window's width to height ratio. Entering a value in either the Width or Height field automatically enters a corresponding value in the other field. With the box unchecked, you can enter any value

Save

Click this button to save the file and close the dialog box.

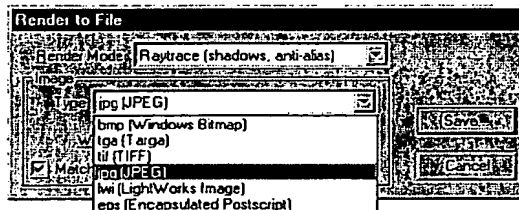
Cancel

Click this button to exit the dialog box without creating a file.

Creating Image Files

This Designer Elements program allows you to create publication quality images with higher resolution images than produced on a typical computer monitor.

1. Create your drawing and apply the render materials to your objects.
2. Choose **PhotoRender>Render to File**.
3. Choose the render mode from the pull-down menu.
4. Choose the image file format you want to create.
5. Enter the desired width and height values. If the Match Width/Height to Drawing Window Aspect box is checked, you only have to enter a value in one field.
6. Click Save to create the file.



Display Last Image Command

Use this command in the Render menu to display your previously rendered scene without having to render your scene again. This command is helpful if a dialog box appears or you inadvertently click your mouse and lose the rendered image. This command saves time if you've rendered your scene with one of the photorealistic commands.

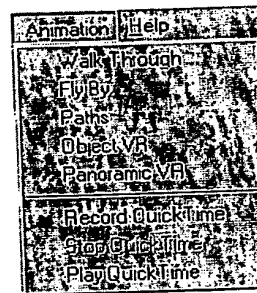
Note: If you rotate your geometry after rendering your scene and then use this command, the image that appears reflects your last rendering and not your current drawing orientation.

Rendering and Multi-processors

If your computer uses multi-processors and you are rendering an image with one of the photorealistic commands, this Designer Elements program will make use of those processors to separate the image into pieces and thus improve the rendering time.

Animation

This Designer Elements program provides the ability to create five types of movies. The animation features are available through the Render menu.



You can create five types of movies. The first three, *Walk Through*, *Fly By* and *Paths*, allow you to specify a path for the camera movement through a scene and require that QuickTime be installed on your Windows or Macintosh computer. The last two, *Object VR* and *Panoramic VR*, allow you to specify the pan or tilt of the camera but the camera path is predefined.

Note: Background images can be used for *Walk Through*, *Fly By* and *Paths* animations. They cannot be used for *Object VR* and *Panoramic VR* animations.

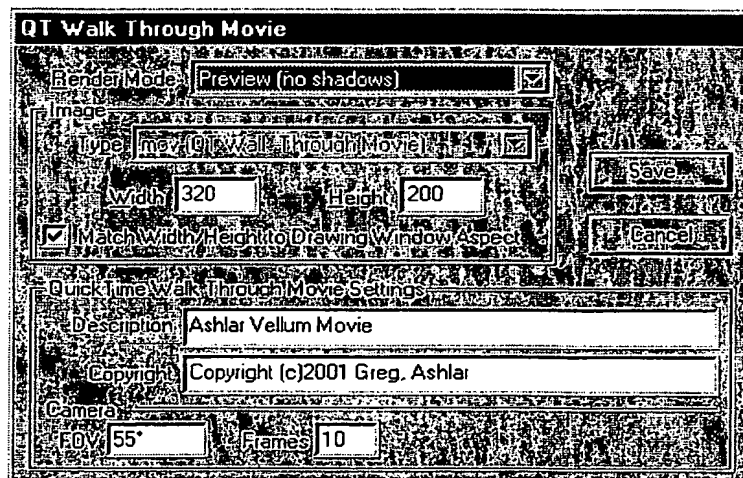
QuickTime Movies with Camera Movement

The *Walk Through*, *Fly By* and *Paths* movies allow you to define the movement of the camera using a curve. As you proceed through the steps to create a movie two dialog boxes appear, the QT Movie dialog box and the Compressor dialog box. These are almost identical for all three of these movie types and allow you to specify the movie settings.

Curve Rules:

- One or more curves can be selected for a path.
- Although path curves should normally be connected, they do not need to be. Disconnected curves will result in a non-continuous jump in the movie.
- Curves cannot be grouped.
- Check the curve direction using **Verify>Show Curvature** to ensure that the direction is correct for the desired animation.
- Select the curves in the desired order.

The QT Walk Through Movie dialog box is shown here.



The dialog box includes the following options:

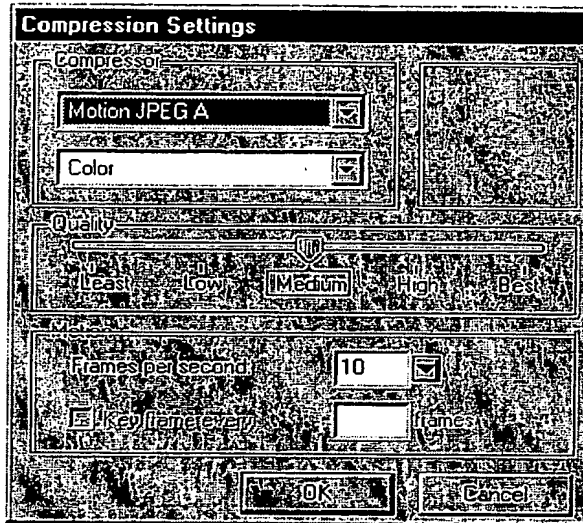
Render Mode

The pull-down menu allows you to set the render mode for the movie. You have six options: Preview

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	(shadows off), Preview (shadows on), Raytrace (shadows off) and Raytrace (shadows on), Raytrace (Shadows off, Anti-Alias) and Raytrace (Shadows on, Anti-Alias).
Image Type	This field displays the image type as mov (QT Walk Through Movie) and cannot be changed in this dialog box. It is set when you choose the animation type.
Image Width/Height	<p>These data fields allow you to specify the image size in pixels. If you want a six inch wide image with 300 dpi, enter 6**300 in the Width data field.</p> <p>These fields function with the Match Width/Height to Drawing Window Aspect check box.</p>
Match Width/Height to (Drawing Window Aspect)	When checked, the image's width to height ratio equals the drawing window's width to height ratio. Entering a value in either the Width or Height field automatically enters a corresponding value in the other field. With the box unchecked, you can enter any value
Description	This field contains the movie description which displays when the movie is viewed. Enter your movie description.
Copyright	This field contains the movie copyright which displays when the movie is viewed. Enter your copyright information.
Camera	This section contains the FOV (Field of View) angle and the Frames for the movie. The FOV field sets the view angle for the camera. The default angle is 55°. The Frames field sets the number images you want generated for the movie. The default number is 10.
Save	Click this button to save the file and close the dialog box.
Cancel	Click this button to exit the dialog box without creating a file.

The Compressor Settings dialog box, shown here, includes the following options:



Compressor Type

The pull-down menu allows you to set the compressor type. The types include Animation, BMP (Windows only), Cinepak, Component Video, DV - NTSC, DV - PAL, Graphics, H.261, H.263, Intel Indeo Video® 4.4 (Windows only), Intel Video® R3.2 (Macintosh only), Intel Raw (Macintosh only), Motion JPEG A, Motion JPEG B, None, Photo - JPEG, Planar RGB (Windows only), PNG, Sorenson Video, TGA (Windows only), TIFF (Windows only) and Video. The movie quality is affected by the compression setting.

Compressor Color

From the pull-down menu you can choose a color option. The options vary according to the compressor type chosen.

Quality

This slider allows you to set the movie quality.

Motion

This section includes the *Frames per second* data field and the *key frame every x frames* check box/ data field.

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Frames per second: Enter the number of frames per second or use the pull-down menu to specify the number.

Key frames every x frames: Enter a number in the data field to guarantee that a specific or key frame will be played back during a certain time frame. Playback speed is affected by the computer speed on which the movie is run. If you later want to sync sound to the movie track, a key frame provides some control. For example: if you create a movie set to 20 frames per second and a key frame every 100 frames, a key frame will be marked every 5 seconds. When the movie is played, the movie will skip frames so that every 5 seconds, the key frame is viewed. This allows a sound track to be synced to the movie using the key frame setting.

This field only activates for the Animation, Cinepak, Graphics, H.261, H.263, Intel Indeo Video® 4.4 (Windows only), Intel Video® R3.2 (Macintosh only), Intel Raw (Macintosh only), Sorenson Video, TGA (Windows only) and Video compressor types.

OK

Click this button to generate the movie

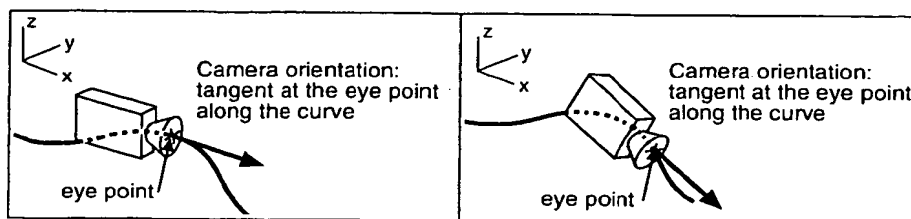
Cancel

Click this button to exit the dialog box without creating a movie.

Walk Through Animation

This animation command creates a walk through movie using a curve to define the camera path. The eye point is on the curve. As the camera moves along the curve,

its orientation is tangential to and along the curve at the eye point. The graphics illustrate the eye point and camera orientation at two locations along a curve.



Each movie frame is taken at a particular location on the curve based on the number of frames. If a curve slopes down, the camera follows the tangent and slopes down as well, resulting in the eye looking down at the angle specified by the tangent. The up vector of the camera is always the z axis.

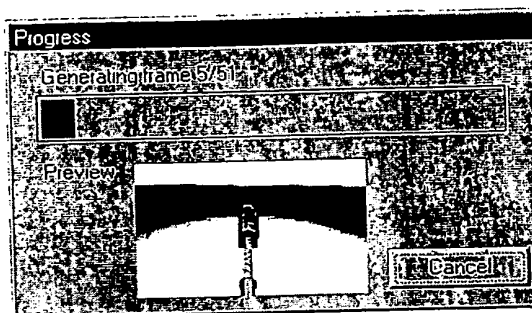
Creating a Walk Through Animation

1. Create a curve along which the camera will travel for the movie.
2. Choose **Animation>Walk Through**. The Message Line reads: *Walk Through Animation: Pick curve for camera eye path [Shift=Extend]*.
3. Select the curve. (Hold down the SHIFT key to select more than one curve.) The QT Walk Through Movie dialog box appears.
4. Choose your settings.
5. Click Save. The Save document As dialog box appears.
6. Type in the movie name and navigate to the location where you want to save the file.
7. Click Save. The Compression Settings dialog box appears.
8. Specify your settings for the compressor.

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- Click OK. A progress dialog box appears providing you with a preview movie window and information on the number of frames generated.

The Message Line provides you with information on the pass, time elapsed and time remaining to generate the movie.

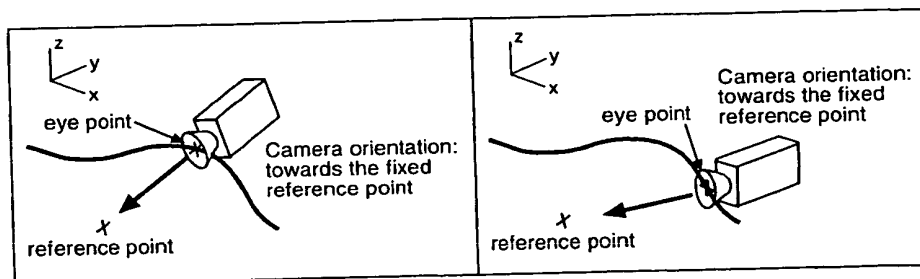


You can click to end the operation before it's complete. This Designer Elements program will finish generating the current frame and write out the movie at that frame. Once the movie is generated you cannot add more frames to it. The dialog box disappears when the movie generation is complete.

- You can now view the movie using QuickTime player.

Fly By Animation

This animation command creates a fly by movie using a curve to define the camera path. The eye point is on the curve. The camera orientation is directed towards the reference point you specify. The up vector of the camera is always the z axis. The reference point never changes. The point can be in space or on an object. The graphics illustrate the eye point, camera orientation and reference point at two locations.



Creating a Fly By Animation

- Create a curve along which the camera will travel for the movie.

2. Choose **Animation>Fly By**. The Message Line reads: *Fly By Animation: Pick curve for camera eye path [Shift=Extend]*.
3. Select the curve. (Hold down the SHIFT key to select more than one curve.)
The Message Line now reads, *Fly By: Pick location for camera reference point*.
4. Pick a reference point location towards which the camera will always be directed.
The QT Fly By Movie dialog box appears.
5. Choose your settings.
6. Click Save. The Save document As dialog box appears.
7. Type in the movie name and navigate to the location where you want to save the file.
8. Click Save. The Compression Setting dialog box appears.
9. Click OK. A progress dialog box appears providing you with a preview movie window and information on the number of frames generated.
The Message Line provides you with information on the pass, time elapsed and time remaining to generate the movie.
You can click to end the operation before it's complete. This Designer Elements program will finish generating the current frame and write out the movie at that frame. Once the movie is generated you cannot add more frames to it. The dialog box disappears when the movie generation is complete.
10. You can now view the movie using QuickTime player.

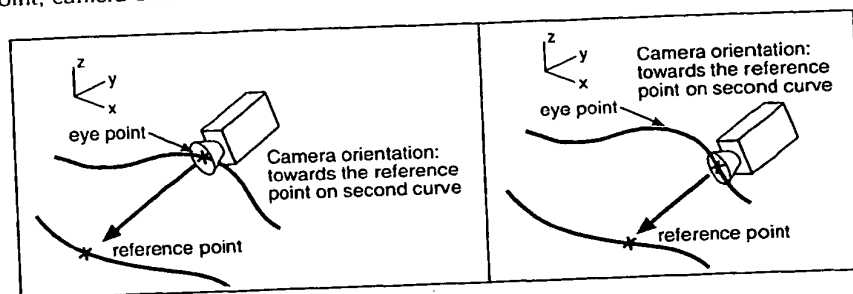
Paths Animation

This animation command creates a paths movie using a curve to define the camera path and another curve to define the location of the reference point towards which the camera is directed. The eye point is on the first curve. The up vector of the camera is always the z axis.

Each of the curves are divided according to the number of frames specified for the movie. The first frame eye point on the camera path curve corresponds to the first

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frame reference point on the reference path curve. The graphics illustrate the eye point, camera orientation and reference point at two locations.



Creating a Paths Animation

1. Create two curves, one to define the camera path and the other to define the reference point towards which the camera is directed.
2. Choose **Animation>Path**. The Message Line reads: *Paths Animation: Pick curve for camera eye path [Shift=Extend]*.
3. Select the camera path curve. (Hold down the SHIFT key to select more than one curve.)
The Message Line now reads, *Paths: Pick curve for camera reference path [Shift=Extend]*.
4. Select the reference point curve.
The QT Paths Movie dialog box appears.
5. Choose your settings.
6. Click Save. The Save document As dialog box appears.
7. Type in the movie name and navigate to the location where you want to save the file.
8. Click Save. The Compression Setting dialog box appears.
9. Click OK. A progress dialog box appears providing you with a preview movie window and information on the number of frames generated.
The Message Line provides you with information on the pass, time elapsed and time remaining to generate the movie.
You can click to end the operation before it's complete. This Designer Elements program will finish generating the current frame and write out the movie at that

frame. Once the movie is generated you cannot add more frames to it. The dialog box disappears when the movie generation is complete.

10. You can now view the movie using QuickTime player.

Backgrounds and Movies

You can put in a background for *Walk Through*, *Fly By* and *Paths* animations.

1. Create your background image in a graphic software.
2. Place the image file in the Textures folder within the PhotoRender folder.
3. Display the Render Library.
4. Select the Backgrounds library and the Images category.
5. Apply the VS Logo image to your background.
6. Choose **PhotoRender>Edit Background**.
7. Select image in the Shader Types list.
8. From the Attribute Value pull-down menu, choose your image.
9. Click OK and render your scene.

QuickTime VR Movies

This Designer Elements program allows you to create two types of VR movies, Object and Panoramic.

QuickTime Object Movie

An object movie keeps the observation point fixed as the eye point is moved at a fixed distance about the observation point. This gives the visual effect of moving completely around an object on the surface of an invisible sphere.

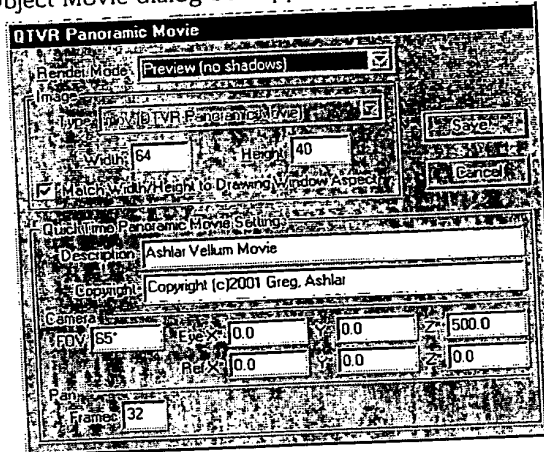
The QuickTime movie options produce an interactive movie that can be viewed with a QuickTime player. (A player and browser Plug In can be obtained from the Apple web site.) Each movie is composed of many individual scene images rendered from a slightly different point of view.

Creating an Object Movie

1. Create your drawing and apply the render materials to your objects.
2. Choose **Animation>Object VR**.

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The QTVR Object Movie dialog box appears.



The dialog box includes these additional options:

Description

This field contains the movie description which displays when the movie is viewed. Enter your movie description.

Copyright

This field contains the movie copyright which displays when the movie is viewed. Enter your copyright information.

Pan

This section contains the fields for setting the pan frames and angle, where a zero angle represents the viewer's eye normal to the model as currently displayed on the screen. Since the pan angle is based on the viewer's eye, the current view of the model is irrelevant.

The *Frames* field sets the number of images generated around the sphere equator (latitude).

The *Angle Min* field sets the location of the minimum pan angle. A zero in this field means the pan will include the 0° location in the pan.

The *Max* field sets the largest angle to include in the pan with 360° as the maximum.

Tilt

The *Start* field sets the starting angle location for the pan. The Start angle must be a value within the range set by the Angle Min and Max fields.

This section contains the fields for setting the tilt frames and angle, where zero represents the viewer's eye normal to the model as currently displayed on the screen.

The *Frames* field sets the number of images generated from pole to pole for the movie.

The *Angle Min* field sets the location of the minimum tilt angle. A zero in this field means the pan will include the 0° location. The minimum angle must be between -90° (looking straight up) and 90° (looking straight down).

The *Max* field sets the highest tilt angle with a maximum angle of 90°.

The *Start* field sets the starting angle location for the tilt. The Start angle must be within the range set by the Angle Min and Max fields.

Camera

This section contains the *FOV* (Field of View) angle, the eye (*Eye X, Y and Z*) and reference (*Ref X, Y and Z*) point coordinates for the movie.

The *FOV* field sets the view angle for the perspective. The standard angle is 60°. A greater angle produces greater distortion, especially when the eye point is within the scene (like a room).

The *Eye X, Y and Z* fields set the location for the eye point.

The *Ref X, Y and Z* fields set the location for the reference point.

The asterisk (*) next to the field indicates your ability to specify locations by clicking in the drawing area. You can also enter the values manually.

3. Enter the desired values.

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4. Click Save to create the movie.

QuickTime VR Panoramic Movie

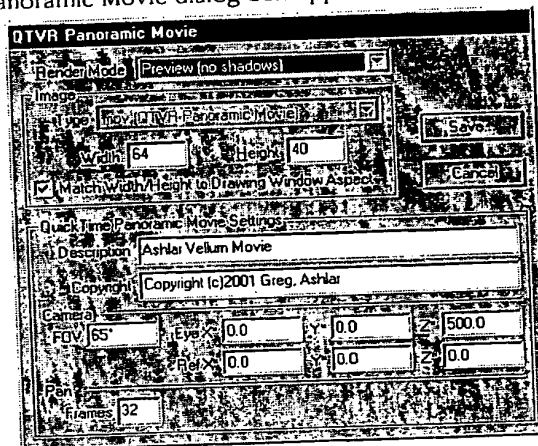
A panoramic movie keeps the eye point fixed as the observation point is rotated 360°. This gives the visual effect of turning 360° in place.

The QuickTime movie options produce an interactive movie that can be viewed with a QuickTime 3.0 player. (A player and browser Plug In can be obtained from the Apple web site.) Each movie is composed of many individual scene images rendered from a slightly different point of view.

Creating a Panoramic Movie

1. Create your drawing and apply the render materials to your objects.
2. Choose **Animation>Panoramic VR**.

The QTVR Panoramic Movie dialog box appears.



The dialog box includes these additional options:

Description

This field contains the movie description which displays when the movie is viewed. Enter your movie description.

Copyright

This field contains the movie copyright which displays when the movie is viewed. Enter your copyright information.

Pan

The Frames field sets the number images you want generated for the movie. The default number is 32.

Camera

This section contains the *FOV* (Field of View) angle, the eye (*Eye X, Y and Z*) and reference (*Ref X, Y and Z*) point coordinates for the movie.

The *FOV* field sets the view angle for the perspective. The standard angle is 60°. A greater angle produces greater distortion, especially when the eye point is within the scene (like a room).

The *Eye X, Y and Z* fields set the location for the eye point.

The *Ref X, Y and Z* fields set the location for the reference point.

The asterisk (*) next to the field indicates your ability to specify locations by clicking in the drawing area. You can also enter the values manually.

3. Enter the desired description and values.
4. Click Save to create the movie.

Perspective Rendering

This Designer Elements program provides you with the ability to render your model in perspective using the advanced rendering commands. This perspective capability is not available for the basic render modes.

The perspective commands include the *Perspective ON/OFF* check box that is in the modify view dialog box.

Tech Note:

Perspective settings do not save with a file. Be careful not to have two files open with different settings. If you do the last file overrides the first.

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